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VERNMENT

*Memorandum*

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ELKO DISTRICT OFFICE
2002 Idaho Street
Elko, Nevada 89801

IN REPLY REFER TO:
1791
N-10521
(N-013.1)

To : State Director, Nevada (N-911) Date: April 16, 1975

FROM : District Manager, Elko

SUBJECT : Elko Oil and Gas/Geothermal Steam Leasing EAR

I have reviewed the Elko energy resource leasing EAR and concur with recommendations for mitigating measures.

The following stipulations should be attached to all leases within the area encompassed by the Elko EAR:

1. Because the district contains areas of unsuitable or highly erodible soils, the lessee will, prior to entry on the lands, discuss the proposal activity with the authorized officer from the appropriate land management agency. Said authorized officer may require additional measures for the protection of the soil. Such measures may be:

    a. Restricted surface occupancy for:
        (1) Selected erodible soil areas.
        (2) Periods of excessive soil moisture and runoff.

    b. Require special reclamation techniques in frail environmental areas.

2. The following described lands have been identified as critical habitat for the mating, nesting and brood-rearing of sage grouse. Therefore, prior to entry onto the lands, the lessee (operator) will discuss the proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor, and the management agency's authorized officer who may require additional measures for the protection of the sage grouse. Such measures may include:

    a. There will be no surface occupancy on the actual strutting grounds.

    b. Restriction of activity during the months of April through July in brood-rearing areas.

    (For Sage Grouse Strutting Grounds, see Illustration XIV, Page 41(b).)

3. The following described lands support antelope populations within the Elko District. These areas contain specific habitat types and conditions

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selected by antelope as kidding areas. Therefore, prior to entry upon public lands within the described areas, the lessee (operator) will discuss proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor, and the management agency's authorized officer who may require additional measures for the protection of antelope. Such measures may include:

a. No surface occupancy on actual kidding grounds.

b. Restriction of activity in these areas for the months of June and July.

(Antelope Ranges are identified on Page 111.)

4. The following described lands have been identified as favorable habitat supporting relatively high population densities of prairie falcons and golden eagles. Therefore, prior to entry onto the public lands within the described area, the lessee (operator) will discuss the proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor and the management agency's authorized officer who may require additional measures for the protection of the prairie falcons and golden eagles. Such measures may include:

   a. No surface occupancy of selected areas.

   b. Restriction of activity near nest sites during the months of March through June.

   (Falcon and Eagle Areas are identified on Pages 112 and 113.)

5. The following described lands have been identified as critical habitat for wintering herds of mule deer. Therefore, prior to entry onto the public lands within the described area, the lessee (operator) will discuss the proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor and the management agency's authorized officer who may require additional measures for the protection of mule deer while utilizing these areas. Such measures may include:

   a. Restriction of activity in identified areas during the winter months of November through March.

   b. No surface occupancy of selected sites.

   c. Special reclamation techniques.

   (Mule Deer Critical Winter Ranges are identified on Page 115.)

## 6. Antiquities and Objects of Historic Value

### a. Oil and Gas Stipulation

The lessee shall immediately bring to the attention of the authorized officer any antiquities or other objects of historic or scientific interest, including but not limited to historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this lease, and shall leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the authorized officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 U.S.C. 431-433).

Prior to operations, the lessee shall furnish to the authorized officer a certified statement that either no archaeological values exist or that they may exist on the leased lands to the best of the lessee's knowledge and belief and that they might be impaired by oil and gas operations. Such certified statement must be completed by a qualified archaeologist acceptable to the authorized officer.

If the lessee furnishes a statement that archaeological values may exist where the land is to be disturbed or occupied, the lessee will engage a qualified archaeologist, acceptable to the authorized officer, to survey and salvage, in advance of any operations, such archaeological values on the lands involved. The responsibility for the cost for the certificate, survey, and salvage will be borne by the lessee, and such salvaged property shall remain the property of the lessor or the surface owner.

### b. Geothermal Energy Stipulation

The certified statement required by Section 18 of the lease form must be completed by a qualified archaeologist, acceptable to the authorized officer.

All lease applications will be individually examined by the land management agency and those mitigating measures recommended in the EAR that are appropriate for the individual lease will be recommended for inclusion therein.

The other mitigating measures will be recommended for inclusion in the plan of operation where appropriate.

Attached is the original copy of the signature page and the request from the Ruby Lake Refuge Manager that this be forwarded to the Regional Director for signature.

Would you forward for concurrence and once signed, return the original to me for copy and distribution. We will certainly be happy to have this job complete.

Moore

1 Enclosure:
  Encl. 1 - Signature Page

cc:
District Manager, Boise
District Manager, Ely
District Manager, Battle Mountain
Supervisor, Humboldt National Forest
Refuge Manager, Ruby Lake National Wildlife Refuge

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# ENVIRONMENTAL ANALYSIS RECORD

# OIL AND GAS - GEOTHERMAL STEAM

# LEASING

ELKO DISTRICT

N-10521

No. 27-010-4-82

In cooperation with:

Humboldt National Forest
Ruby Lake National Wildlife Refuge
Battle Mountain, Nevada, Ely, Nevada, and Boise, Idaho,
  BLM Districts
Elko, Eureka, Lander and White Pine Counties

# TABLE OF CONTENTS

Page

INTRODUCTION AND SUMMARY 1

I. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES 3
- A. Proposed Action 3
- B. Alternatives to the Proposed Action 3
- C. Legal Authority for Energy Leasing 4
- D. Stages of Implementation 4

II. DESCRIPTION OF EXISTING ENVIRONMENT 6
- A. Non-Living Components 6
  - 1. Air 6
  - 2. Land 7
  - 3. Water 16
- B. Living Components 22
  - 1. Plant Life 22
  - 2. Animal Life 35
    - a. Aquatic 35
    - b. Terrestrial 37
      - (1) Domestic Stock and Horses 37
      - (2) Wildlife 37
        - (a) Mammals 37
        - (b) Birds 40
        - (c) Reptiles 42
        - (d) Invertebrates 42
        - (e) Man 42
- C. Ecological Interrelationships 44
  - 1. Ecological Processes 44
    - a. Succession 44
    - b. Food Relationships 45
    - c. Hydrological Cycle 47
- D. Human Interest Values 48
  - 1. Landscape Characteristics 48
  - 2. Social-Cultural Interest 54
    - a. Education/Scientific 54
    - b. Cultural Values 63
    - c. Social Welfare 68
    - d. Attitudes and Expectations 78
    - e. Local Regulatory Structure 78
    - f. Hazards to Human and Animal Health 78

Page

III. ANALYSIS OF THE PROPOSED ACTION AND ALTERNATIVES 80
- (I) The Environmental Impacts of the Proposed Action 80
  - A. Anticipated Impacts 80
    - 1. Non-Living Environment 81
    - 2. Living Components 89
    - 3. Ecological Interrelationships 94
    - 4. Human Interest Values 95
  - B. Possible Mitigating or Enhancement Measures 96
  - C. Residual Impacts 104
  - D. Relationship Between Short-Term Use and Long-Term Productivity 105
  - E. Irreversible and Irretrievable Commitments of Resources 106
- (II) Alternative Actions 107
  - Alternative I 107
  - Alternative II 108
  - Alternative III 109

IV. RECOMMENDATIONS FOR MITIGATION OR ENHANCEMENT OF ENVIRONMENTAL IMPACTS 110

V. PERSONS, GROUPS AND GOVERNMENTAL AGENCIES CONSULTED 113

VI. INTENSITY OF PUBLIC INTEREST 113

VII. PARTICIPATING AGENCY STAFF 113

VIII. RECOMMENATION CONCERNING THE NEED FOR AN ENVIRONMENTAL STATEMENT 114

IX. SIGNATURES 114

X. REFERENCES 116

1791
N-10521
(N-013.1)

## INTRODUCTION AND SUMMARY

The data in this Environmental Analysis Record is supplementary to data included in the Companion Elko Energy Resource Development Technical Report. Both the Environmental data and the Technical data must be considered together to reach a judgement as to the conduct and impacts of Oil and Gas or the geothermal leasing program. For area covered, see map, Exhibit "A".

The Technical Report contains a detailed description of the proposed action, the specific technical details of oil and gas or geothermal development, and the economic implications of such development. The Technical Report should be read first to provide the background upon which this Environmental Analysis Record is based. Material presented in the Technical Report is not repeated in the analysis.

Several areas within the Elko District have pending lease applications for either oil and gas or geothermal resources leasing. Within the District boundaries are four Known Geothermal Resource Areas. These are located at Beowawe, Hot Springs Point (Crescent Valley), Elko Hot Springs, and Sulphur Hot Springs (Ruby Valley).

The area encompassed by this Environmental Report is 7,115,235 acres of public lands within the Elko Bureau of Land Management District; 7,680 acres administered by the Battle Mountain BLM District; 124,000 acres administered by the Ely BLM District; 52,508 acres administered by the Boise-Idaho BLM District; 1,079,896 acres of forest reserve administered by the Humboldt National Forest, USFS; 37,657 acres of wildlife withdrawal administered by the U.S. Fish and Wildlife Services and 28,805 acres administered by the Bureau of Reclamation. Interspersed are 3,727,637 acres of private lands, and state lands which are excluded from the subject Environmental Report. Also excluded are 16,545 acres of withdrawn lands segregated from all mineral entry.

Current uses of the lands within the report area include mining and minerals leasing, livestock grazing, woodland harvest, a variety of outdoor recreation, wildlife habitat, watershed and wild horse ranges.

The exploration phase of both oil and gas and geothermal resources is similar in character. This was discussed in depth within the attached Technical Report.

This Environmental Analysis supercedes and retires the previously prepared oil and gas analysis for Ruby Valley, N-7540; Goshute, N-7539; and Pine Valley, N-7333 (excluding that in the Battle Mountain District). The purpose is to include these areas in the analysis for all energy resource exploration and development. The intent of the recommendations for the previous analysis were not altered by this report; however, language changes and additions occurred.

The District EAR excludes that portion of the District covered under the EAR for Cherry Creek, N-8673 and Baker, N-8674.

The development phase for both types of energy resources entails access road and well site construction, drilling and testing wells, transporting the raw energy supply over short distances to either a storage tank (oil and gas), or an electrical generation plant and by-product processing plant (geothermal), and sanitation-waste disposal facilities. The geothermal development will also require facilities for disposal of waste liquid. By development, land would be preempted or restricted from uses such as wildlife habitat, recreational use and grazing. Terrain would be modified through construction of roads, wells, pipelines, and industrial facilities. Noise and noxious gaseous emissions could pose problems during testing and production. Possible adverse effects include land subsidence due to production of fluids and increased seismicity due to production and reinjection of fluid wastes into nonproducing zones.

Consistent with the spirit and intent of the National Environmental Policy Act of 1/1/70, the objectives of the Environmental Analysis are:

1. To identify the anticipated environmental impacts of proposed actions and modify those actions to minimize adverse environmental impacts or to enhance beneficial impacts.

2. To help determine if an Environmental Statement is required.

3. To document the justification for not writing an Environmental Statement if that decision is made.

## I. DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES:

### A. Proposed Action

The Proposed Action is the issuance of leases for oil and gas or geothermal exploration and development on the resource lands within the Elko area as identified in Exhibit "A".

The leases would be subject to the general lease terms and the general Surface Disturbance Stipulations which are routinely incorporated in U.S. Department of Interior leases with the addition of special stipulations where needed to protect specific resource values. This alternative may involve no surface occupancy during critical periods for certain resource values, or may be restricted by land management agency stipulations for environmental protection.

### B. Alternatives to the Proposed Action

Three alternatives to the Proposed Action have been identified. They are:

1. Issue oil and gas or geothermal leases within the proposed area, subject to the general lease terms and the general Surface Disturbance Stipulations which are routinely incorporated in U.S. Department of Interior leases.
2. Decline lease action.
3. Postpone pending further study.

Alternative I - Issue oil and gas or geothermal leases within the proposed lease area subject to the General USDI Stipulations only.

Alternative II - Issue no oil and gas or geothermal leases in the proposed lease area.

Alternative III - Issue no oil and gas or geothermal leases in the proposed lease area pending further study.

### C. Legal Authority for Energy Leasing

1. The oil and gas energy program will be conducted under the authority of the Mineral Leasing Act of 2/25/20, as amended, and regulations of 43 CFR 3100. The Proposed Action and Alternative No. I involves:

    a. The submission of "Notices of Intent to Conduct Oil and Gas Exploration Operations" (Form 3040-1), on areas not connected with a lease.

b. The issuance of non-competitive oil and gas leases (Form 3120-3).

c. The issuance of oil and gas leases by simultaneous lease offer and competitive bidding (Form 3120-3).

2. The geothermal energy leasing program will be conducted under the 1970 Geothermal Steam Act and regulations in 43 CFR 3200 which became effective January 1, 1974. The proposal involves:

   a. The approval of "Notices of Intent to Conduct Geothermal Resource Exploration Operations" on areas not connected with a lease (Form 3200-9).

   b. Issuance of Non-Competitive Geothermal Resource Leases (Form 3200-21).

   c. Issuance of Geothermal Resource Leases (Form 3200-21), on Known Geothermal Resource Areas by competitive bidding.

## D. Stages of Implementation

Four Separate Stages of Implementation have been identified with each stage contingent on successful completion of the preceding stage. These are as follows:

1. Exploration - Includes all activities from the decision to explore for an oil and gas or geothermal field through the drilling of one or more "Wildcat" or exploration wells. The discrete operations are:

   a. Aerial surveys
   b. Off-road vehicular travel
   c. Road and trail construction
   d. Drill site preparation and drilling
   e. Rehabilitation.

2. Development - This is the period of most intense activity. If the site is productive, development would include the following discrete operations:

   a. Road construction
   b. Drill site development
   c. Oil and gas development facilities
   d. Geothermal steam development facilities
   e. Waste disposal
   f. Rehabilitation.

3. Operation - This phase is principally the production and maintenance interval. It includes the following discrete operations:

   a. New drill sites
   b. Maintenance of existing facilities
   c. Waste disposal
   d. Production
      (1) oil and gas
      (2) geothermal steam.

4. Close-Out - This interval is the site abandonment phase. The discrete operations are:

   a. Removal of surface equipment
   b. Surface rehabilitation and capping drill holes or wells
   c. Waste disposal.

These stages are described in detail in the Technical Report and considered in Section III of this analysis. Alternatives II and III would preclude any implementation within the lease area.

## II. DESCRIPTION OF EXISTING ENVIRONMENT:

### A. Non-Living Components

### 1. Air

#### a. Air Quality and Pollutants

Northern Nevada, in the vicinity of the subject area, does not have an air quality monitoring station; however, the quality is generally considered excellent. No comprehensive data is available concerning the concentration level of noxious gases. Small quantities of carbon monoxide, hydrocarbons, sulphur oxides and nitrogen oxides are produced from internal combustion engines associated with vehicle, aircraft or stationary equipment within the subject area. The concentration of vehicles, even on Interstate Highway 80, is not of significant degree to cause noticeable reduction in air quality.

Sulfur dioxide, hydrogen sulphide and related gases are released to the atmosphere by some of the hot springs within the subject area. The quantities are generally thought to be low and have insignificant effect upon air quality.

Occasional wildfire or prescribed burning in the subject area emits particle matter into the air and produces noticeable deterioration of air quality within areas of close proximity to the source. However, this factor is usually of short duration and air quality is restored once the fire goes out.

Dust is a pollutant factor during late summer or early fall storm activity. High velocity winds raise dust particles from the numerous valley playas both within and outside the subject area. Other contributing areas are roads, farmlands and other surface disturbance sites.

There are no known man-caused radiological contaminants within the subject area.

#### b. Air Movement

The prevailing winds are from the southwest. The primary storm track is from the Northern Pacific Weather System and enters the area from the west or northwest. Occasionally, frontal activity occurs from other directions, usually from the south.

Air inversions occur occasionally and are associated primarily with late winter weather. These are generally of short duration and allow only a minor buildup of stagnant air. The occurrence is found mainly in the lower portions of the airsheds - the valleys.

c. Temperature

The annual temperature fluctuation varies within the subject area from winter lows of -30 degrees F. in the mountains and -20 degrees F. at Elko to summer highs of 85 degrees F. in the mountains, 100 degrees F. at Elko and 100+degrees F. in the southern valleys.

## 2. Land

Illustration 1 shows the Great Soil Groups Distribution within the subject area. Briefly, these are described in the following paragraphs:

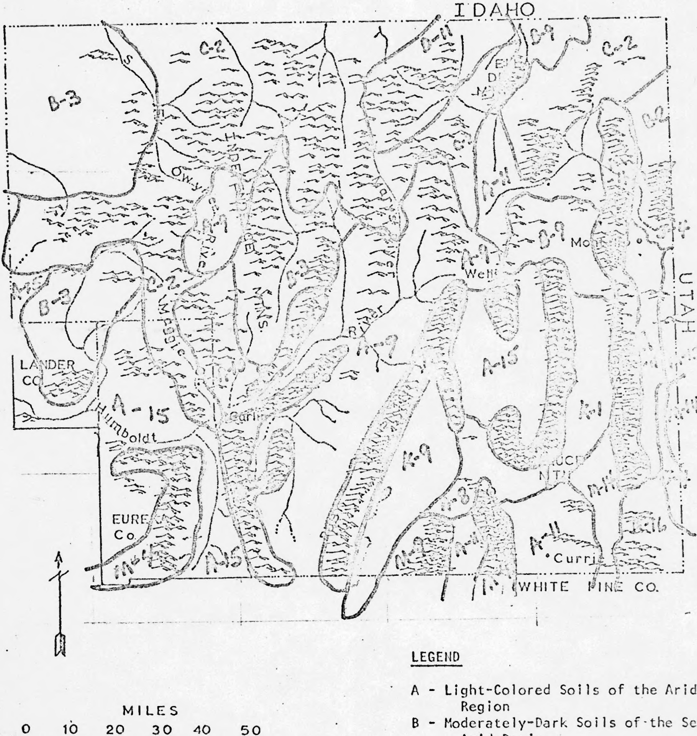
Soil Region A - These are light colored arid soils with sagebrush, grass and desert shrub vegetation formed in loess, or alluvium and including some soils with bedrock at a shallow depth. Calcium carbonate accumulations and silica calcium carbonate hardpans (caliche) are common (all groups), and are saline and sodium affected soils (A-11, 15 and 16). These are primarily the desert and sierozem soils.

Soil Region B - These are slightly dark colored semi-arid soils with grass-sagebrush vegetation, formed in loess, basalt, or alluvium and including some soils with bedrock at a shallow depth. Calcium carbonate accumulations and silica calcium carbonate hardpan are common, as are some sodium-affected soils, These are primarily the brown soils with minor inclusions of lithosol and calcisol.

Soil Region C - These are the dark colored, semi-arid soils with grass-sagebrush vegetation formed in loess basalt, granitic or rhyolitic rocks, or alluvium. Many of these soils contain bedrock at a shallow depth. Calcium carbonate accumulations are common and occur about three feet below the surface. These are the chestnut soils with minor inclusions of brown and lithosol soils.

Illustration No. 1

## GREAT SOILS GROUPS
## FROM
## SOILS OF THE WESTERN UNITED STATES



## LEGEND

A - Light-Colored Soils of the Arid Region
B - Moderately-Dark Soils of the Semi-Arid Region
C - Dark-Colored Soils of the Semi-Ari Region
D - Dark-Colored Soils of the Sub-Humi Region
J - Saline Soils
K - Recent Alluvia Soils
M - Immature Shallow Soils

Soil Region D - These are dark colored, sub-humid soils with mountain shrubgrass vegetation formed in alluvium from basalt, rhyolite and granitic rocks on mountain slopes or plateaus. Calcium carbonate accumulations not common; however, where found, are at about four feet below the surface. These are the prairie soils with minor inclusions of lithosol and chestnut soils.

Soil Region J - These are light colored arid soils with salt-shrub vegetation formed from limestone alluvium. The soils are very fine-textured, low in organic content, high in salt accumulation, and are highly susceptible to wind and water erosion. The soil is underlain by calcareous hardpan at shallow depth. These are the solonetz soils with inclusions of solonchak and alluvial soils.

Soil Region K - These are recent formed alluvial soils located within desert valleys and support sagebrush-grass vegetation (K-9). The K-1 soils are gravely, well-drained with a calcareous deposit underlain at moderate depth. The K-9 soils are generally fine-textured soils with high organic content and calcareous deposit at depth of about three feet. The K-1 is the alluvial soil and the K-9 is the low-humic gley with inclusions of alluvial and sierozem soils.

Soil Region M - These are primarily immature, shallow mountain soils formed from residum, colluvium and alluvium from limestone, quartzite and granitic rock sources (M-4, 6, 9 and 13). The M-14 soils are formed on the valley playas from salty locustrine and alluvial materials. The former groups are generally shallow over bedrock and support a variety of mountain shrubgrass vegetation species while the latter are generally barren or support a sparce cover of saltbush-saltgrass vegetation on pedestaled soil or humics. These are mainly the lithosol soils with inclusions of sierozem and regosol soils (M-4, 6, 9 and 13), or salt playas with inclusions of solonetz or regosol soils (M-14).

a. Soil Depth

Soils within the subject area range in depth of deep (over 60") on the valley bottoms through shallow (10" to 20") on some mountain sites.

Valley soils are generally moderately deep (20"-40") to deep over-restrictive layers of clay or caliche (A-8, A-15, J-4, M-14, K-1 and K-9). Benchland soils are generally moderately deep over gravel or caliche (A-9, A-11, A-16, B-3, B-9 and C-2). Mountainland soil varies in depth dependent upon

site. Canyon bottom soils are generally deep over gravel or clay layers and ridgetops are generally stony, immature, shallow soils over bedrock (B-2, B-3, C-2, D-11, M-4, M-6, M-9 and M-13). For further soils information, see the BLM District URA, the Humboldt National Forest soils and vegetation studies and the Humboldt River Basin study reports.

### b. Soil Structure

Generally, the soils of the southern part of the subject area are derived from igneous granitics, metamorphic quartzites and sedimentary sandstones, siltstone and limestone. The soils of the northern areas are generally derived from igneous rhyolites, or intrusive granites and metamorphic quartzites.

The valley lowland soils are generally fine-textured and vary from moderately well-drained in the north to generally poorly-drained with alkali concentrations in the southern portion of the subject area.

The valley upland soils are generally medium to stony or gravely-textured and well-drained. There are many areas where a hardpan can be found at moderate depths.

The mountain highland soils are generally medium to stony or rocky-textured and are well to excessively-drained.

### c. Soil Nutrient Properties

The soils of the subject area are generally moderately to highly productive. The exceptions lie in those valley areas where saline concentration has altered plant growth or in the shallow excessively-drained soils located along the mountaintops. Generally, the soil pH is 8.0 to 9.5 within the subject area.

### d. Soil Pollutant Properties

There are few areas where pollutants have affected soil. These are generally small areas and confined to mining operations at millsites or leaching ponds. Also, 51 small areas have been affected by drilling mud solutions during past oil and gas or geothermal exploration. These latter sites are generally less than 1/2 acre in size.

### e. Soil Erosion

The erosion hazard classification for the subject area is generally considered as moderate; however, sites and soils are variable. Both wind and water are significant erosion factors and are of particular importance within the valley soils or on disturbed areas. Geologic erosion is present on the Pilot, Goshute, Cherry Creek, Granite, Ruby, East Humboldt, Jarbidge, Mahoganies, Independence, Snowstorm and Cortez Mountains. The Pequops, Snake, Grouse Creek, Tuscarora and Sulphur Springs Mountains are generally stable.

### f. Geology

The geologic history of the Elko District is quite complex. It consists of long periods of sediment deposition by shallow seas, several stages of mountain building (and subsequent erosion of those mountains), Tertiary basin filling, extensive vulcanism (Tertiary and Quaternary), block faulting (Basin and Range stage of mountain building), glaciation, and subsequent basin flooding by glacial lakes.

During the latter part of the Precambrian Era and most of the Paleozoic Era (a time span of about 375 million years), a majority of the District was covered by warm shallow seas that deposited carbonate rocks. The northwestern corner of the Elko District was the site of a deep trough that deposited a clastic (broken fragment) suite of sedimentary rocks. This period of deposition was interrupted by intensive mountain building (the Antler Orogeny), at the end of the Devonian Period (350 to 360 million years before present). As a result of this mountain building, clastic rocks from the west were pushed to the east, and now lie on top of the carbonate rocks. The mineralization that accompanied the Antler Orogeny created some of the more famous mining areas within the Elko District (e.g. Cortez, Tuscarora and Carlin).

The Mesozoic Era was the time of erosion and continental clastic deposition, punctuated by pulses of extensive mountain building. The main feature of this mountain building was a huge range of north-south trending mountains called the Mesocordilleran Geanticline. During the creation of this range, Paleozoic sedimentary rocks of the Elko District were uplifted, deformed, and eroded (those rocks involved in the earlier Antler Orogeny were further deformed). Concurrent with these pulses of mountain building was the intrusion of granitic bodies (called batholiths - greater than 40 square miles in area, and stocks - less than 40 square miles). The

largest intrusion in the Elko District is the Ruby Range Batholith; smaller intrusions are in the Contact area (south of Jackpot), Silver Zone Pass, and the Whitehorse Mountains. Mineralization associated with these intrusions lead to such mining districts as Contact, Delano, Dolly Varden and Spruce Mountain.

The Cenozoic Era was one of erosion, basin filling, vulcanism, and mountain building. Mountains that had been created during the Mesozoic Era were being subdued by erosion into gently rolling highlands and intervening basins. These basins were not only being filled with erosional debris from the surrounding highlands, but were also being affected by airborne volcanic ejecta supplied from neighboring volcanic centers. Because the basins were occasionally the sites of seasonal lakes, most of the volcanic material was waterlaid. A good example of this type of deposit in the Elko District is the Late Miocene (an epoch of the Tertiary Period), Humboldt formation. This formation consists of Diatomite (a sediment composed of siliceous skeletons from microscopic, one-celled plants), fine-grained water-deposited volcanic ejecta, siltstone and shale.

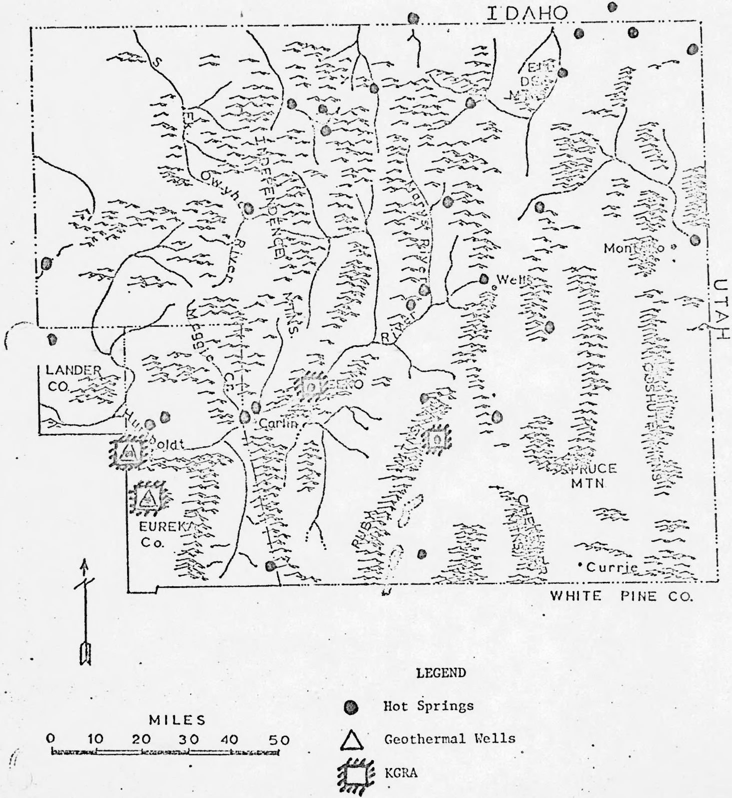
In addition to erosion and basin filling, the Tertiary Period was also a time of extensive volcanic activity resulting in lava flows that covered large portions of the District. Metalliferous deposits that have yielded a large production (almost exclusively in gold, silver and mercury), are associated with these flows.

Sometime prior to the deposition of the Humboldt Formation (10 to 13 million years before present), the first phases of block faulting that would eventually be responsible for the Great Basin's present landscape began. The culmination of this block faulting (approximately 1 to 3 million years before present), resulted in essentially north-south trending ranges and intervening valleys that now extend from the Sierra Nevada Range in California, to the Wasatch Front in Utah. Higher ranges within the District, specifically the Ruby Range, East Humboldt Range and the Jarbidge Mountains, have been sculptured by the scouring action of Pleistocene (Ice Age), glacial ice. The resulting features are "U"-shaped valleys (Lamoille Canyon, East Fork Boulder Creek, and Jarbidge Canyon), horns (the Matterhorn, Green Mountain, and Sherman Mountain), and moraines. The intervening

Basin and range depicted by photo of the Lamoille Valley and the Ruby Mountains.

valleys are enclosed basins (no external drainage), that not only accumulated erosional debris from the surrounding ranges, but were also the sites of pluvial (glacial) lakes during the Ice Age (Pleistocene Epoch). When those lakes receded at the close of the Pleistocene, they left behind them such relict shore features as lake terraces, sandbars and spits. The centers or lowest portions of these basins are usually characterized by playas; a playa is a vegetation-free, flat-floored area composed of thin, evenly-stratified (layered) sheets of fine clay, silt, or sand. There may also be deposits of soluable salts precipitated by evaporating water that have been trapped in the enclosed basin. Good examples of such playas in the Elko District are (from west to east): Ruby Valley, Clover Valley, Independence Valley, Steptoe Valley and Antelope Valley.

ILLUSTRATION II
Geothermal Resource



## Land Use Compatability

Existing land uses are reasonably compatible. The subject area has a wide variety of land uses including livestock grazing, prospecting and mining, crop production, wildlife habitat; and recreational uses of hunting, fishing, rockhounding, sightseeing, camping and water sports.

Livestock use on a native meadow in the Granite Range near Jackpot, Nevada.

Livestock grazing conflicts with wildlife on the meadow areas within the subject area and deer winter ranges are impacted by livestock use during the growing season. The critical areas are in the Spruce Mountain, Overland Pass, Medicine Range, Ela Dee and Owyhee Canyon deer winter range areas. Excessive numbers of wild horses are seriously depleting groundcover and wildlife forage in several areas including many of the foregoing winter range areas.

Primitive values are restricted to small, rough, steep, mountainous or river canyon areas, while man's influence is in evidence elsewhere. The area is traversed by Federal highways I-80, U.S. 93 and U.S. 50; State highways 11, 20, 21, 30, 43 and 46; approximately 2,500 miles of county graveled roads and several thousand miles of BLM, USFS, mine access, range users, and hunter roads. There are several power rights-of-way, a gas pipeline right-of-way, communication rights-of-way, an underground cable right-of-way and many communication relay sites within the subject area.

At present, there are two areas designated as wilderness or scenic areas. These are the Ruby Mountain Scenic Area and the Jarbidge Wilderness Area. Currently, primitive studies are being conducted on the Ruby, the Jarbidge and the Independence mountain areas for possible expanded wilderness designation by USFS.

Photo depicts primitive characteristics in the Jarbidge mountains. The roadless area in the background is being studied for possible wilderness designation by the USFS.

The BLM has identified the South Fork of the Owyhee River Canyon, the Jarbidge River Canyon and the Bruneau River Canyon for possible wild and scenic river classification or primitive withdrawals. Other areas which have been identified with primitive characteristics are the South Fork Little Humboldt River, the Pilot Range and the Goshute Mountains. Refer to Exhibit "B" maps showing primitive-scenic areas.

The area receives off-road vehicle use from ranchers, prospectors, hunters, rockhounds and recreation vehicles. Only the very rough, steep slopes escape this use. During the winter, snow machines are numerous in the basins of the larger mountain ranges. This use is particularly important at Lamoille Canyon, Tent Mountain, Angel Lake, Jarbidge, Pole Creek, Green Mountain, Wildhorse Reservoir and Adobe Summit.

The southeast and southwest portions of the subject area are spared intensive uses primarily because water is limited on most locations. The remaining area has an abundance of springs, brooks and rivers, thus the potential and higher development. Uses dependent upon water will be limited in all areas because waters are fully allotted. Most rights date back to the 1870s and 1880s.

Agricultural activity associated with the watered valleys. Available water from Wilson Creek has allowed the development.

Many of the uses are compatible in the present mix. There is some controversy relative to: (1) unnecessary landscape destruction during construction or prospecting; (2) livestock competition with deer on the winter ranges; (3) wild horse impact through distribution and numbers; and (4) destructive farming practices.

Stream channeling, a destructive farming practice, as shown by the photo taken on Canyon Creek.

h. Land Use Suitability

Lands within the subject area are generally suitable for existing uses. Generally, uses of the valleys and low benchlands are dictated by water availability and soil and as a rule, are highly suitable for many uses. Uses of the high benchlands and low ranges are dictated by slope, exposure and soils and there are moderate restrictions affecting mainly agriculture and urban uses. Uses of the mountain areas are dictated by slope, surface characteristics and harsh environment, and in many areas, results in high restriction of a variety of uses. Only a small percentage of the subject area falls within the latter land class.

3. Water

a. Hydrologic Cycle

Annual precipitation varies within the subject area from lows of approximately 5" in the southeastern valleys to approximately

45" along the crest of the Ruby and Jarbidge Mountains. Of the total moisture, approximately 60% occurs as snow within the valleys, benches and low mountains, and approximately 75% occurs as snow in the mountain areas. The open pan or lake surface evaporation potential varies widely with elevation and aspect. Generally, the valley and low benchlands have an evaporation potential of approximately 45 to 55"; the low mountain lands 30 to 45"; and the mountain lands 20 to 34".

The stream systems of the Elko District are components of four separate and specific drainage systems: Snake River System, Lahontan System, Bonneville System and the Interior Basins of East Central, Nevada. Refer to Illustration III - Streams of Northeastern Nevada.

The Snake River System drains northeastern and north central Nevada via eight northerly flowing tributaries which are from west to east: Lake Creek, South Fork of the Owyhee River, East Fork of the Owyhee River, Bruneau River, West Fork of the Jarbidge River, East Fork of the Jarbidge River, Salmon Falls Creek and Goose Creek. All head in Elko County with the exception of a fork of Lake Creek.

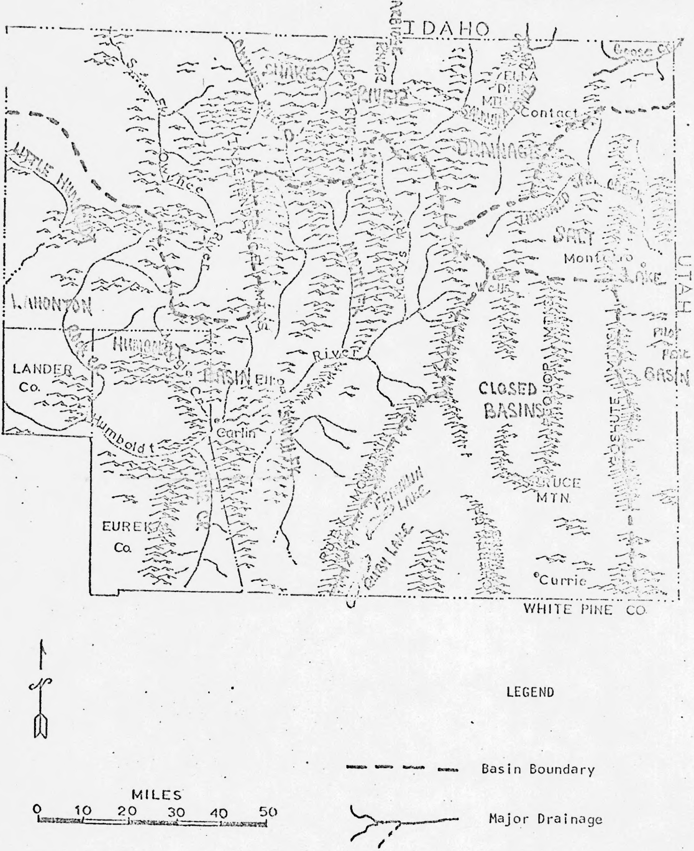
The Humboldt River system, the eastern portion of the Lahontan Basin, drains the central and southwest portions of the subject area. The Humboldt is formed by a series of tributaries descending from more mountainous elevations to contribute to the main stem from both north and south. Major tributaries originating within the subject area include Mary's River, South Fork Humboldt, North Fork Humboldt, Maggie Creek, Pine Creek, Rock Creek and the Little Humboldt River.

Only a minor fragment of the vast Bonneville Drainage System of Utah overlaps into eastern Nevada. Like elements of the Snake System to the north, the Nevada Bonneville consists of a series of separate streams, all small, flowing into Utah chiefly from east slopes of Nevada eastern ranges.

The most prominent stream within the Wells Resource Area flowing into Utah is Thousand Springs Creek.

Thousand Springs Creek, rising on the east slope of Burnt Mountains, flows eastward for more than 60 miles before entering Utah.

ILLUSTRATION III
RIVER BASIN DRAINAGES



Between the Lahontan and Bonneville Systems lies a cluster of more or less completely enclosed basins in the center and very heartland of the Great Basin. This is a region where the dynamics of geologic action has disrupted the topographic and drainage patterns to an almost unmatched degree.

The separate drainage basins are Ruby Valley, Clover Valley, Independence Valley, Steptoe Valley and Antelope Valley. During the early geologic time, these were covered by large lakes including Bonneville, Clover, Waring and Antelope Lakes (Water Reconnaissance Report No. 56, Division of Water Resources, State of Nevada).

Refer to Illustration IV, Water Yield Data for drainages of the subject area.

### b. Water Quality

While there exists some variation among streams of the Snake River drainage, in general, it can be said they are essentially the same type of streams. In general, these waters are clearer, swifter and contain less dissolved solid and suspended matter than do rivers of the Lahontan System.

In relation to the Snake Drainage, in general, the Nevada stems are in the nature of high headwater streams. Their gradient is quite steep averaging nearly 200' per mile.

Typical watercourse characteristics for most upper watersheds in the subject area. North Fork Salmon Falls Creek near the Wilson Creek confluence.

ILLUSTRATION IV

The following chart*depicts water yield date in acre feet within Basin areas:

| Snake River Drainage | Estimated Ppt. | Ground Water Recharge | Estimated Basin Ground Water Storage | Surface Outflow[1/] |
|---|---|---|---|---|
| Owyhee Ssytem | 1,470,000 | 45,900 | 15,000,000 | 192,000 |
| Bruneau System | 831,000 | 58,000 | - | 189,000 |
| Salmon Falls | 1,021,000 | 44,000 | - | 98,000 |
| Goose Creek | 19,800 | 6,700 | - | 23,000 |
| **Salt Lake Drainages** | | | | |
| Thousand Springs-Grouse Creek | 624,000 | 12,700 | 2,000,000 | 10,000 |
| Pilot, Salt Lake & Antelope Valley | 508,000 | 11,900 | 1,430,000 | 100 |
| **Local Closed Basins** | | | | |
| Ruby Valley | 699,333 | 68,000 | 5,560,000 | - |
| Clover-Independence lley | 427,500 | 30,000 | 7,450,000 | - |
| Goshute Valley | No Date Available | | | |
| **Humboldt System** | | | | |
| South Fork | 890,000 | 30,000 | 5,000,000 | 90,500 |
| Pine Valley | 400,000 | 46,000 | 1,920,000 | 8,400 |
| Remaining Humboldt | 3,560,000 | No Data Available | | 180,000 |

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1/ Water outflow from the basin - not total run off.

* Dates summorized from:

Water Resource - Reconnaisance Reports 2, 35, 42, 47, 48 & 56
Division of Water Resources
State of Nevada
Hydrologic Recon. Humboldt River
Bulletin No. 32
Dept. Conservation (Nat. Res.)
State of Nevada

Hydrology of Eastern Nev.
Water Res. Bulletin No. 12
State of Nevada

These waters, in keeping with their headwater characteristics, are cold natural trout streams.

The Humboldt River shows marked extremes in opacity. Beginning as clear water, the river rapidly picks up solutes and sediments with downstream progression until the waters become grayish-brown in color and opaque, while the dissolved oxygen content decreases. The deteriorated water quality common throughout most of the Humboldt system limits fish life to only dace and carp except for the higher quality waters of the stream system's upper reaches.

The Thousand Springs system is closely related to the Humboldt River characteristics. This stream begins as clear water from large springs in the Snake Range north of Wells. Within a few miles, the water assumes a light brown color. The system carries a high concentration of dissolved solids and water quality deteriorates to a degree that fishlife is limited to dace species. At its lowest elevation prior to entering the Salt Lake desert, the water is classed as marginal for agricultural use.

The waters of the closed basin system are found primarily at the spring source. These systems are small, and intermittent in characteristic. The Ruby Marsh Refuge has the largest flow and water body in the basin areas. Not only is the largest flow common with the refuge, but also the highest water quality.

Geologic erosion and frail soils contribute heavily to sedimentation within drainages of the closed basins. The occurrence of high intensity summer storms or wet mantle flood events results in channel cutting and heavy sedimentation during a short period of intermittent flow. Other systems of the subject area are also susceptible to these conditions; however, the significance is controlled to some extent by soils and cover. Streams with significant sedimentation are the Humboldt River (main stem), Salmon Falls River, Goose Creek and Thousand Springs Creek. These systems have moderate geologic erosion or soils susceptible to erosion as the major difference in comparison with the other stream systems. In general, suspended solids in surface waters of the subject area vary from 45 ppm (Snake River drainage) to an extreme of 6,700 ppm (Salt Lake drainage) and pH values vary from 7.2 to 8.5. Both water quality values vary by location within the watershed. Higher

watershed areas yield lower suspended solids and pH values than the lowland areas.

Photo depicts many lowland stream channel characteristics, primarily those in the frail soils locations. Note the solid debris and potential for high suspended solids. The photo is of Rock Springs Creek, a tributary to Thousand Springs Creek.

These values further vary considerably during spring runoff periods because high volumes of water tend to increase suspended solids and lower pH.

Refer to Illustration V for Water Quality data. P. 20(a).

Generally, the waters of the subject area are suitable for agricultural uses; fish and waterfowl; water-based recreational use; and stockwater. Most wells or higher watersheds provide water suitable for human consumption (less than 500 ppm solutes). A few isolated areas have waters with salts and suspended solid concentrations that limit the use. These are generally in the lower reaches of the southern watersheds.

Industrial spill is a potential and has occurred during the past - the Rio Tinto Mine leach operation polluted the Owyhee River when acid escaped the tailing area and entered the river and a spill at the Carlin Gold plant polluted downstream stock reservoirs.

# ILLUSTRATION V

The table* that follows depicts the general dissolved solids within the lower segiments of the drainage systems.

| | Disolved Solids PPM | PH | EPA 1/ Single Max. Discharge Standar PPM |
|---|---|---|---|
| South Fork Owyhee River | 182 | 8.1 | 250 |
| East Fork Owyhee River | 156 | 8.0 | 200 |
| Jarbidge | 45 | 7.3 | 75 |
| West Fork Bruneau River | 58 | 7.6 | 235 |
| Salmon Falls River | 145 | 8.2 | 250 |
| Goose Creek | 179 | 8.0 | 200 |
| Thousand Springs Creek | 1239 | 8.3 | - |
| Spring S.E. Corner Pilot Range | 6700 | 7.6 | - |
| South Fork Humboldt | 264 | 8.0 | - |
| Little Humboldt | 268 | - | - |
| mboldt River at Carlin | 335 | 8.1 | - |
| mboldt at Moline | 452 | - | - |
| Sulpur Hot Springs Ruby Valley | 499 | - | - |

Salinity Hazard 0-750 ppm - low, 750-1500 medium detrimental to sensitive crops, 1500-3000 High detrimental to most crops & trout, 3000-75000 used only by tolerent crops on well drained soils, 7500+ unsuitable water.

1/ State of Nevada Water Quality Standards

* References

Irrigation Water of Nevada
U. of N. Experiment Sta. Bul. 187

Hydrologic Recon. of Humboldt River Basin
Water Resource Bul. No. 32
Nevada Dept. of Conservation, Natural Resource

Water Resource Reconnaissance
Reports 2, 35, 47 & 48.
Division of Water Resource
State of Nevada

Table 1.--Location and topographic map coverage of selected hot springs and wells

| Spring or well | Location | Topographic map coverage |
|---|---|---|
| | Churchill County | |
| 1 Lee Hot Springs | Unsurveyed (lat. 39°12' N., long. 118°43' W.) | Allen Springs, Nev. (15'); Reno, Nev. (2°) |
| 2 Dixie Valley Hot Springs | SE 1/4 sec. 5 and NE 1/4 sec. 8, T. 22N., R. 35E. | Dixie Hot Springs, Nev. (15'); Reno, Nev. (2°) |
| 3 Flowing well in Stillwater | SW 1/4 sec. 7, T. 19N., R. 31E. | Stillwater, Nev. (15'); Reno, Nev. (2°) |
| | Douglas County | |
| 1 Walleys Hot Springs | NE 1/4 sec. 22, T. 13N., R. 19E. | Minden, Nev.-Calif. (7-1/2'); Walker Lake, Calif.-Nev (2°) |
| | Elko County | |
| ✓1 Hot Hole | NE 1/4 sec. 21, T. 34N., R. 55E. | Elko, west, Nev. (7-1/2'); Elko, Nev.-Utah (2°) |
| ✓2 Sulphur Hot Springs | NW 1/4 sec. 11, T. 31N., R. 59E. | Lamoille, Nev. (15'); Elko, Nev.-Utah (2°) |
| 3 Unnamed hot spring (Hot Creek) | NW 1/4 sec. 12, T. 28N., R. 52E | Pine Valley, Nev. (15'); Winnemucca, Nev. (2°) |
| 4 Nile Spring | SW 1/4 sec. 30, T. 47N., R. 70E. | Goose Creek, Nev.-Utah-Idaho (15'); Wells, Nev.-Utah-Idaho (2°) |
| 5 Mineral Hot Spring CONTACT | sec. 16, T. 45N., R. 64E. | Delaplain, Nev.-Idaho (15'); Wells, Nev.-Utah-Idaho (2°) |
| 6 Unnamed hot spring near Wells | sec. 20, T. 38N., R. 62E | Oxley Peak, Nev. (7-1/2'); Wells. Nev.-Utah-Idaho (2°) |
| 7 Unnamed hot spring near Wells | NE 1/4 sec. 17, T. 38N., R. 62E. | Oxley Peak, Nev. (7-1/2'); Wells, Nev.-Utah-Idaho (2°) |
| 8 Unnamed hot spring (Wild Horse Reservoir) | SE 1/4 sec. 4, T. 43N., R. 55E. | Wild Horse, Nev. (15'); Wells, Nev.-Utah-Idaho (2°) |
| 9 Unnamed hot spring (SSE Patsville) | Unsurveyed (lat. 41°5' N., long. 115°55' W.) | Mountain City, Nev.-Idaho (15'); Wells, Nev. Utah-Idaho (2°). |
| 10 Hot Sulphur Springs | NE 1/4 sec. 8, T. 41N., R. 52E. | Tuscarora, Nev. (15'); McDermitt, Nev.-Ore.-Idaho (2°) |
| 11 Unnamed hot spring near Carlin | sec. 33, T. 33N., R. 52E. | Carlin, Nev. (15'); Winnemucca, Nev.(2°) |
| 12 Unnamed hot spring near Ruby Marsh | NW 1/4 sec. 2, T. 27N., R. 58E. | Ruby Lake NW, Nev. (7-1/2'); Elko, Nev.-Utah (2°) |
| | Eureka County | |
| 1 Walti Hot Springs | SW 1/4 sec. 33, T. 24N., R. 48E. | Walti Hot Spring, Nev. (15'); Millet, Nev.(2°) |
| ✓[illegible] | NE 1/4 sec. 11, T. 29N., R. 48E. | Crescent Valley, Nev. (15'); Winnemucca, Nev. (2°) |
| ✓[illegible] | NW 1/4 sec. 17, T. 31N., R. 48E. | Dunphy, Nev. (15'); Winnemucca, Nev. (2°) |
| [illegible] | SE 1/4 sec. 8, T. 31N., R. 48E. | Dunphy, Nev. (15'); Winnemucca, Nev. (2°) |
| 5 Bartholomae Hot Springs | SE 1/4 sec. 28, T. 18N., R. 50E. | Antelope Peak, Nev (15'); Millett, Nev. (2°) |

The Chemical Composition and Estimated Minimum Thermal Reservoir Temperatures of the Principal Hot Springs of Northern and Central Nevada, USGS Open File Report. Mariner, R.H., et al, 1974.

(206)

Table 2.--Chemical analyses of selected hot springs and wells

[Concentrations in milligrams per liter; parentheses indicate supplementary samples; n.a. indicates not available]

Key + boxes indicate higher subsurface temp.

| Spring or well | Temperature (°C) | pH | Specific conductance | Silica ($SiO_2$) | Calcium (Ca) | Magnesium (Mg) | Sodium (Na) | Potassium (K) | Lithium (Li) | Bicarbonate ($HCO_3$) | Carbonate ($CO_3$) | Sulfate ($SO_4$) | Chloride (Cl) | Fluoride (F) | Boron (B) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Churchill County | | | | | | | | | | | | | | | |
| 1 Lee Hot Springs | 88 | 7.36 | 2,430 | 180 | 44 | 0.6 | 450 | 26 | 0.70 | 114 | <1 | 470 | 380 | 7.9 | 2.4 |
| 2 Dixie Valley Hot Springs | 72 | 8.59 | 914 | 115 | 3.6 | .02 | 190 | 6.5 | .33 | 111 | 11 | 111 | 126 | 16.3 | .89 |
| 3 Flowing well in Stillwater | 96 | 7.57 | 6,910 | 170 | 108 | 1.7 | 1,480 | 42 | 1.94 | 90 | <1 | 190 | 2,200 | 5.0 | 15 |
| Douglas County | | | | | | | | | | | | | | | |
| 1 Walleys Hot Springs | 61 | 8.77 | 726 | 58 | 10 | .01 | 145 | 3.6 | .20 | 50 | 9 | 235 | 44 | 4.9 | 1.2 |
| Elko County | | | | | | | | | | | | | | | |
| 1 Hot Hole | 56 | 7.21 | 908 | 65 | 60 | 15.5 | 120 | [illegible] | .33 | 488 | 1 | [illegible] | 16 | 1.9 | .70 |
| 2a Sulphur Hot Springs | [illegible] | 8.53 | 601 | [illegible] | 1.0 | .03 | 135 | 8.9 | .46 | 244 | 15 | 40 | 23 | 17.7 | .20 |
| 2b Sulphur Hot Springs | 45 | 8.63 | 652 | [illegible] | 1.6 | .02 | 150 | 9.8 | .51 | 247 | 12 | 40 | 4 | 19.0 | .23 |
| 3 Unnamed hot spring (Hot Creek) | 26 | 7.30 | 408 | 20 | 46 | 23.5 | 10 | 2.1 | .02 | 226 | 1 | 27 | 4.6 | <0.1 | .03 |
| (4) Nile Spring | 43 | 7.2 | 321 | 31 | 40 | 11.5 | 10 | 5.6 | <.2 | 149 | -- | 37 | 8.7 | .4 | <.02 |
| (5) Mineral Hot Spring | 60 | 9.1 | 344 | 83 | 1.6 | <.01 | 75 | 2.2 | <.2 | 108 | -- | 45 | 15 | 8.9 | .47 |
| (6) Unnamed hot spring near Wells | 50 | 7.3 | 753 | 165 | 12 | .3 | 160 | 16 | .8 | 345 | -- | [illegible] | 22 | 10 | 1.2 |
| (7) Unnamed hot spring near Wells | 61 | 7.3 | 1,650 | 105 | 75 | 37 | 300 | [illegible] | .8 | [illegible] | -- | 32 | 27 | 7.2 | .89 |
| (8) Unnamed hot spring (Wild Horse Reservoir) | 54 | 7.2 | 818 | 40 | [illegible] | 12 | [illegible] | 22 | .5 | 482 | -- | 40 | 14 | 5.2 | .67 |
| (9) Unnamed hot spring (SSE Patsville) | 41 | 7.4 | 624 | 23 | 29 | 7.7 | 110 | 8.3 | .4 | 380 | -- | 36 | 4.4 | 3.4 | .22 |
| (10) Hot Sulphur Springs | [illegible] | 7.0 | 1,760 | 84 | 49 | 13 | 390 | [illegible] | .7 | [illegible] | -- | 18 | [illegible] | 7.2 | .77 |
| (11) Unnamed hot spring near Carlin | [illegible] | 7.6 | 625 | 70 | 60 | 15 | 45 | 16 | n.a. | 335 | -- | [illegible] | 12 | n.a. | n.a. |
| (12) Unnamed hot spring near Ruby Marsh | [illegible] | 8.0 | 600 | 50 | 45 | 12 | 58 | 14 | n.a. | 377 | -- | 24 | 6.5 | n.a. | n.a. |
| Eureka County | | | | | | | | | | | | | | | |
| 1 Walti Hot Springs | 72 | 6.47 | 592 | 68 | 56 | 12 | 44 | 14 | .3 | 264 | <1 | 64 | 12 | 2.5 | .12 |
| 2 Hot Springs Point | 54 | 6.63 | 1,730 | 67 | 53 | [illegible] | 230 | [illegible] | 1.1 | [illegible] | <1 | 7 | 1 | 6.6 | 2.1 |
| 3 [illegible] well | -- | 9.38 | 1,490 | 500 | 1.3 | .2 | 250 | 38 | 2.1 | 505 | 81 | 64 | [illegible] | <.05 | 2.5 |
| 4 Unnamed hot spring | [illegible] | 8.98 | 1,020 | 320 | 1.0 | <.1 | 230 | 16 | 1.3 | 321 | 32 | [illegible] | [illegible] | 17 | 2.1 |

The Chemical Composition and Estimated Minimum Thermal Reservoir
Temperatures of the Principal Hot Springs of Northern and Central
Nevada, USGS Open File Report. Mariner, R.H., et al, 1974.

(20c)

Little data is available concerning nutrient levels, solid debris and coliform contaminants. Acid balance data available has been summarized in the foregoing Water Quality Table. Dissolved oxygen data for surface and ground waters is lacking; however, upper stream reaches are generally oxygen saturated, while lower reaches and ground waters are generally deficient.

Water temperatures are variable within the area and each drainage system. In general, surface waters vary in seasonal temperatures from a maximum of 33 degrees F. to 82 degrees F. and an average of 33 degrees F. to 77 degrees F. for the Humboldt River at Carlin (33 degrees F. to 76 degrees F. for Salmon Falls River - BLM Thermograph - October, 1972, to September, 1973). Most subsurface water temperatures are in the range of approximately 50 degrees F. to 60 degrees F. Hot water areas within the subject area vary from 138 degrees, well temperature, at Winecup Ranch to 414 degrees F., well temperature, at Beowawe. There are numerous warm springs throughout the subject area. Refer to the Water Resource Reconnaissance Reports published by the Division of Water Resources, State of Nevada, for additional or specific water temperature data.

## B. Living Components

### 1. Plant Life

Vegetation in the subject area varies from alpine in some of the higher elevations to saltbrush-desert shrub in the lower elevations and enclosed basins.

Map Exhibit C shows the distribution and location of major vegetation zones within the subject area.

The diversity in topography, soils and climate of the area results in the occurrence of eight vegetative zones (some were combined because of overlapped communities). A vegetative zone is a large climax unit, the boundaries of which are caused primarily by the effects of climate and soil on the distribution of dominant species of the zone.

The sagebrush-grass zone shown on the map is the largest type in the subject area. Within this type, is a variety of plants which make up the understory.

Illustration VII contains a listing of the most common plants of the subject area.

#### a. Aquatic Vegetation and Riparian Zones

Aquatic vegetational areas are very limited on public lands within the subject area. These sites are confined to stream courses, large spring areas, reservoirs, alpine lakes, Franklin Lake and the Ruby Wildlife Refuge.

The major freshwater stream, lake and marsh vegetation consists of species as follows:

| Common Submergent Vegetation | Habitat |
|---|---|
| Hardstem Bulrush | Lowland marsh |
| Broad-leaved Cattail | Lowland marsh |
| Common Bladderwort | Lowland marsh |
| Broad-leaved Pondweed | Lowland marsh |
| American Milfoil | Lowland marsh |
| Water Starwort | Alpine lakes |
| Water Cress | Mainly mountain springs, lakes and streams |
| Muskgrass | Lowland marsh |
| Bolanders Quilwort | Alpine lakes |
| Narrow-leaf Bur-reed | Alpine lakes |
| Broad-fruited Bur-reed | Lowland marsh |
| Duckweed Fern | Lowland ponds |
| Alpine Pondweed | Alpine lakes |
| Algae | Many species in several sites |

ILLUSTRATION VII
Common Plants

# PLANT LIST - NORTHEASTERN NEVADA
(Dominant Plants)

## GRASSES

| Common Name | Scientific Name | Plant Symbol | Plant Character |
|---|---|---|---|
| bluegrass, big | Poa ampla | POAM | PNG |
| bluegrass, Nevada | Poa nevadensis | PONE3 | PNG |
| bluegrass, Sandberg | Poa Secunda | POSE | PNG |
| brome, smooth | Bromus inermis | BRIN2 | PIG |
| cheatgrass (downy chess) | Bromus tectorum | BRTE | AIG |
| dropseed, sand | Sporobolus crytandrus | SPCR | PNG |
| fescue, Idaho | Festicca idahoensis | FEID | PNG |
| muhly, mat | Muhlenbergia richardsonis | MURI | PNG |
| needleandthread | Stipa comata | STCO4 | PNG |
| needlegrass, Thurber | Stipa thurberiana | STTH2 | PNG |
| orchardgrass | Dactylis glomerata | DAGL | PIG |
| ricegrass, Indian | Oryzopsis hymenoides | ORHY | PNG |
| sacaton, alkali | Sporobolus airoides | SPAL | PNG |
| saltgrass (desert saltgrass) (inland saltgrass) | Distichlis stricta | DIST | PNG |
| squirreltail, bottlebrush | Sitanion hystrix | SIHY | PNG |
| timothy | Phleum pratense | PHPR3 | PIG |
| wheatgrass, bluebunch (Bearded bluebunch wheatgrass) | Agropyron spicatum | AGSP | PNG |
| wheatgrass, desert (standard crested wheatgrass) | Agropyron desertorum | AGDE2 | PIG |
| wheatgrass, slender | Agropyron trachycaulum | AGTR | PNG |
| wheatgrass, streambank | Agropyron riparium | AGRI | PNG |
| wheatgrass, thickspike | Agropyron dasystachyum | AGDA | PNG |
| wheatgrass, western (bluestem wheatgrass) | Agropyron smithii | AGSM | PNG |
| wildrye, creeping (beardless wildrye) | Elymus triticoides | ELTR3 | PNG |
| wildrye, basin (giant wildrye) | Elymus cinereus | ELCI2 | PNG |

## GRASSLIKE PLANTS

| | | | |
|---|---|---|---|
| bulrush | Scirpus spp. | -- | PNGL |
| rush | Juncus spp. | -- | PNGL |
| sedge | Carex spp. | -- | PNGL |
| spikerush | Eleocharis spp. | -- | PNGL |

## TREES, SHRUBS AND HALF SHRUBS

| Common Name | Scientific Name | Plant Symbol | Plant Character |
|---|---|---|---|
| aspen, quaking | Populus tremuloides | POTR5 | NT |
| bitterbrush, antelope | Purshia tridentata | PUTR2 | NS |
| birch, water | Betula occidentalis | BEOC2 | NT |
| ceanothus, snowbush (buckbrush) | Ceanothus velutinus | CEVE | NS |
| chokecherry | Prunus virginiana | PRVI | NT |
| eriogonum | Eriogonum spp. | -- | -- |
| elderberry, blue | Sambucus caerulea | SACA10 | NS |
| gooseberry, (current) | Ribes spp. | -- | NS |
| grape, Oregon (creeping barberry) | Berberis repens | BERE | NS |
| greasewood (black greasewood) | Sarcobatus vermiculatus | SAVE4 | NS |
| hawthorn, Douglas | Crataegus douglasii | CRDO2 | NT |
| hopsage, spiny | Grayia spinosa | GRSP | NS |
| horsebrush, gray | Tetradymia canescens | TECA2 | NS |
| horsebrush, littleleaf | Tetradymia glabrata | TEGL | NS |
| horsebrush, spiny | Tetradymia spinosa | TESP2 | NS |
| juniper, Utah | Juniperus osteosperma | JUOS | NT |
| mountain mahogany, curlleaf | Cercocarpus ledifolius | CELE3 | NS |
| pickleweed (iodine bush) | Allenrolfea occidentalis | ALOC2 | NS4HS |
| pine, limber | Pinus flexilis | PIFL2 | NT |
| pinon, singleleaf | Pinus monophylla | PIMO | NT |
| princesplume, desert | Stanleya pinnata | STPI | NHS |
| pricklypear, brittle | Opuntia fragilis | OPFR | NS4S |
| rabbitbrush, Douglas (yellowbrush) | Chrysothamnus viscidiflorus | CHVI8 | NS |
| rabbitbrush, downy Douglas | Chrysothamnus viscidiflorus puberulus | CHVIP | NS |
| rabbitbrush, rubber | Chrysothamnus nauseosus | CHNA2 | NS |
| rose, Woods | Rosa woodsii var ultramontana | ROWOU | NS |
| sagebrush, big | Artemisia tridentata | ARTR2 | NS |
| sagebrush, black | Artemisia arbuscula nova | ARARN | NS |
| sagebrush, bud | Artemisia spinescens | ARSP5 | NS |
| sagebrush, low | Artemisia arbuscula | ARAR8 | NS |
| saltbush, Nuttall (Gardner saltbush) | Atriplex nuttallii | ATNU2 | NHS |
| seepweed, alkali | Suaeda fruticosa | SUFR | IHS |
| serviceberry | Amelanchier alnifolia | AMAL2 | NS |
| shadscale | Atriplex confertifolia | ATCO | NS |
| skeletonweed, thorn | Lygodesmia spinosa | LYSP | PNF |
| snakeweed, broom (snakeweed)(matchbrush) | Guttierrezia sarothrae | GUSA2 | NHS |
| snowberry, Utah | Symphoricarpos oreophilux var. utahense | SYORU | NS |
| willow | Salix spp. | -- | -- |
| winterfat (whitesage) | Eurotia lanata | EULA5 | NHS |
| yellowbrush | Chrysothamnus viscidiflorus lanceolotus | CHVIL | NS |
| yellowbrush | Chrysothamnus viscidiflorus stenophyllus | CHVIS | NS |

## FORBS

| Common Name | Scientific Name | Plant Symbol | Plant Character |
|---|---|---|---|
| alfalfa | Medicago sativa | MESA | PIF |
| aster | Aster spp. | -- | -- |
| balsamroot, arrowleaf | Balsamorhiza sagittata | BASA3 | PNF |
| bluebells, Arizona | Mertersia arizonica var leonardi | MEARL | PNF |
| cattail, common | Typha latifokia | TYLA | PNEF |
| cinquefoil | Potentilla spp. | -- | -- |
| eriogonum | Eriogonum spp. | -- | -- |
| fleabane (daisy) | Erigeron spp. | -- | -- |
| gilia | Gilia spp. | -- | -- |
| globemallow | Sphaeralcea spp. | -- | PNF |
| stoneseed | Lithospermum ruderale | LIRU4 | PNF |
| groundsel | Senecio spp. | -- | -- |
| gumweed, curlycup | Grindelia squarrosa | GRSQ | BNF |
| halogeton | Halogeton glomeratus | HAGL | AIF |
| hawksbeard, taper tip (smooth hawksbeard) | Erepis acuminata | CRAC2 | PNF |
| hedgemustard (tumblemustard) | Sysymbrium spp. | -- | -- |
| horsemint (Nettleleaf gianthyssop) | Agastache urticifolia | AGUR | PNF |
| Indianpaintbrush (paintedcup) | Castilleja spp. | -- | -- |
| iris, Rockymountain | Iris missouriensis | IRMI | PNF |
| knotweed, prostrate | Polygonum aviculare | POAV | ANF |
| larkspur | Delphinium spp. | -- | -- |
| lettuce, prickly | Lactuca serriola | LASE | BIF |
| lily, sego | Calochortus nuttallii | CANU3 | PNF |
| lomatium | Lomatium spp. | -- | PNF |
| lupine | Lupinus spp. | -- | -- |
| milkvetch (locoweed) (poisonvetch)(loco) | Astragalus spp. | -- | -- |
| blazingstar, whitestem (whitestem stickleaf) | Mentzelia albicaulis | MEAL6 | ANF |
| mullein, flannel | Verbascum thapsus | VETH | BIF |
| mustard (bird rape) | Brassica spp. | -- | AIF |
| onion, tapertip | Allium acuminatum | ALAC4 | PNF |
| penstemon | Penstemon spp. | -- | -- |
| pepperweed, clasping (perfoliated peppergrass) | Lepidium perfoliatum | LEPE2 | AIF |
| phlox | Phlox spp. | -- | PNF |
| poison hemlock | Conium maculatum | COMA2 | BIF |
| povertyweed | Iva axillaxis | IVAX | PNF |
| pricklepoppy | Argemone munita | ARMU | ANF |
| Russian thistle | Salsola Kali var tenuifolia | SAKAT | AIF |
| skeletonweed, thorn | Lygodesmia spinosa | LYSP | PNF |
| stickseed | Lappula spp. | -- | AIF |
| summercyprus, Belvedere | Kochia scoparia | KOSC | AIF |
| sunflower, common (Kansas sunflower) | Helianthus annuus | HEAN3 | ANF |

## FORBS

| Common Name | Scientific Name | Plant Symbol | Plant Character |
|---|---|---|---|
| oneflower helianthella (little sunflower) | Helianthella uniflora | HEUN | PNF |
| sweetclover, white | Melilotus alfa | MEAL2 | BIF |
| sweetclover, yellow | Melilotus officinalis | MEOF | BIF |
| goldenpea (mountain thermopsis)(yellow pea) | Thermopsis montana | THMO3 | PNF |
| thistle | Cirsium spp | -- | PNF |
| wildcabbage, thickstem | Caulanthus crassicaulis | CACR11 | PNF |
| wyethia, mulesear (mulesear dock) | Wyethia amplexicaulis | WYAM | PNF |
| yarrow (western yarrow) | Achillea millefolium lanulosa | ACMIL | PNF |

| Common Riparian Vegetation | Habitat |
|---|---|
| Skunk Cabbage | Subalpine and mountain meadows |
| Hairgrass | Subalpine and mountain meadows |
| Moss Species | Ponds, marsh and streams |
| Alpine Timothy | Mountain meadows |
| Grape Fern | Alpine bogs |
| Horse Tail | Wet areas and bogs |
| Arrowgrass | Marshy areas and alpine lakes |
| Sedge | Damp marshy areas |
| Wire Rush | Damp marshy areas |
| Wild Irie | Damp meadow areas |
| Dandelion | Damp meadow areas |
| Silver Weed | Alkali meadows |
| Cinquefoil | Meadow areas |
| Violet | Meadow areas |
| Water Hemlock | Marshy areas |
| Yarrow | Meadow areas |
| Mat Muhly Grass | Meadow areas |
| Alkali Sacaton | Meadow areas - lowlands |
| Desert Saltgrass | Meadow areas - lowlands |
| Streambank Wheatgrass | Meadow areas - lowlands |
| Cordgrass | Meadow areas - lowlands |
| Willow | Lowlands, alpine wet areas and streams |
| Rose | Lowlands, alpine wet areas and streams |
| Birch | Subalpine streams |
| Marsh Marigold | Subalpine meadows |

Photo depicts meadow and marsh lands vegetation found on lowland sites.

Photo depicts typical stream riparian vegetation.

Photo depicts typical high mountain meadow vegetation as represented by the USFS photo of Lamoille meadow.

Photo depicts typical dry or semi-wet meadow areas frequent throughout the subject area bordering springs, seeps, water courses and areas where a high water table occurs.

Phreatophyte Vegetation - Deep rooted plants obtaining water supply from the water table - Occur within or adjacent to mesic areas. In general, the water table of the meadow areas is estimated to be four to ten feet below the surface. Soils of the meadow areas are generally deep, rich clay-loams and often highly susceptible to erosion as shown by the small headcut located in the right foreground of the preceding photo.

b. Other Vegetative Sites

(1) Saltbrush - Desert Shrub Vegetation Zone

Vegetative species commonly found on lake playas, saline soils and valley benches are as follows:

| Shrubs | Grasses | Forbs |
|---|---|---|
| Shadscale | Alkali Sacaton | Halogeton |
| Greasewood | Saltgrass | Russian Thistle |
| Four-wing Saltbrush | Indian Ricegrass | Alkali Seepweed |
| Nuttals Saltbrush | Sandberg Bluegrass | Pickleweed |
| Spring Hopsage | Cheatgrass | Poverty Weed |
| Spring Horsebrush | Basin Wildrye | Globemallow |
| Bud Sagebrush | | Evening Primrose |
| Broom Snakeweed | | |
| Winterfat (white sage) | | |
| Black Sagebrush | | |
| Rabbitbrush | | |

The vegetation in the valley bottoms with poorly-drained alluvial soils and low rainfall belt is primarily greasewood, shadscale, saltbush, basin wildrye and associated salt tolerant grasses and forbs. The deep alluviums which are moderately-drained support white sage-ricegrass vegetation which will trend to shadscale-ricegrass-bud sage as drainage decreases and pH increases.

Photo depicts typical greaswood sites on heavy, poorly-drained saline valley soil.

Photo shows typical benchland with shadscale and black sagebrush as the dominant vegetation and understory of Sandberg bluegrass, cheatgrass and halogeton.

Photo depicts winterfat sites. Soils of these sites are deep and well-drained.

(2) Sagebrush-Grassland Vegetative Zone

As soil depth and precipitation increases and with moderate drainage, the salt-desert shrub zone is replaced by the sagebrush zone. This zone ranges from approximately 4,800' to 9,500' elevation where annual precipitation exceeds 7". The benchland, with moderate drainage and a gravel or caliche layer at 12-14 inches, supports black sagebrush-ricegrass-squirreltail vegetation. As soil depth increases and with moderate drainage, the primary vegetation is big sagebrush with an understory of squirreltail, Nevada bluegrass, bluebunch wheatgrass and Idaho fescue (at higher precipitation zones), and Thurber's needlegrass. The heavy, moderately-drained soils support rubber rabbitbrush-big sagebrush-basin wildrye-saltgrass-alkali sacaton mixtures. Little rabbitbrush has invaded the sagebrush vegetative types.

The mountain and upland bench vegetation in the 12"+ precipitation zone on loamy soils is big sagebrush, bitterbrush, snowberry, serviceberry and associated perennial grasses and forbs. The major grasses are bluebunch wheatgrass, Nevada bluegrass, Idaho fescue, mountain brome and several species of needle grasses.

Important plants of the zone are:

Shrubs

- Big Sagebrush
- Black Sagebrush
- Low Sagebrush
- Big Rabbitbrush
- Little Rabbitbrush
- Bitterbrush
- Snowberry
- Serviceberry

Grasses

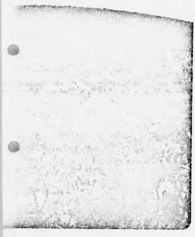
- Western Wheatgrass
- Basin Ryegrass
- Giant Ryegrass
- Indian Ricegrass
- Sandberg Bluegrass
- Cheatgrass
- Squirreltail
- Bluebunch Wheatgrass
- Nevada Bluegrass
- Idaho Fescue
- Thurber's Needlegrass
- Sedges
- Slender Wheatgrass
- Mountain Bromegrass
- Oniongrass
- Columbia Needlegrass

Forbs

- Poverty Weed
- Prickly Pear
- Phlix
- Death Camas
- Buckwheat
- Balsamroot
- Lupine
- Indian Paintbrush
- Locoweed
- Mulesear
- Wild Onion
- Pepperweed
- Penstemon
- Stickseed
- Stoneseed
- Comandra
- Bluebells
- Geranium
- Larkspur

Introduced Seedings

Crested Wheatgrass - Low Flats
Intermediate Wheatgrass - High Benches-Mountains.



Typical lowland sagebrush type.

Low sagebrush type depicted by this photo in O'Neil Basin.

Highland range depicted by the USFS photo.

(3) Pinyon-Juniper Zone

The pinyon-juniper zone is mostly restricted to higher benches and low mountain areas. The vegetative zone is usually found between 5,000' to 10,000' elevation, in a 10" to 16" rainfall belt. The vegetative type is an association of black sagebrush, bitterbrush and big sagebrush with an understory of related perennial grasses. The single-leaf pinyon-pine and Utah juniper are dominants common to the Elko BLM Area, while the Rocky Mountain juniper is common to the National Forest. The latter is found with Utah juniper along streams or around springs in the northern part of the Elko BLM District.

Plants common to the pinyon-juniper zone are:

| Shrubs | Grasses | Forbs | Trees |
|---|---|---|---|
| Big Sagebrush | Western Wheatgrass | Balsamroot | Single-Needle Pinyon-Pine |
| Black Sagebrush | Squirreltail | Lupine | Utah Juniper |
| Bitterbrush | Bluebunch Wheatgrass | Buckwheat | Rocky Mountain Juniper |
| Rabbitbrush | Basin Wildrye | Phlox | |
| Horsebrush | Nevada Bluegrass | Indian Paintbrush | |
| Curl-leaf Mahogany | Cheatgrass | Prickly Pear | |
| | Indian Ricegrass | Collinsia | |
| | Sandberg Bluegrass | Small Larkspur | |

Pinyon-juniper site near Texas Springs. The site is primarily occupied by the Utah juniper with little pinyon. The photo displays several stand characteristics from open grown (foreground) to closed canopy and complete site dominance (center).

Pinyon-juniper site on National Forest land. This is typical of higher elevations and favorable sites. Pinyon is the dominant species.

(4) Mountain Shrub Zone

This vegetative zone is considered as a transition belt between the former sagebrush and pinyon-juniper zones and the sub-alpine-conifer zone of our area. The zone occurs between 7,000 and 10,500' elevation in a 20" to 30" rainfall belt in most higher mountain ranges of the subject area. Major vegetative types and site habitats of the zone are:

Mesic Sites: Aspen-Willow-Cottonwood-Chokecherry-Grass
Zeric Sites: Curleaf Mountain Mahogany-Grass
North Slope-Deep Soils Sites: Snowberry-Buckbrush-Grass.

The more important species of this vegetative zone are listed as follows:

| Shrubs | Grasses | Forbs | Trees |
|---|---|---|---|
| Willow | Mtn. Brome | Senecio | Cottonwood |
| Serviceberry | Slender Wheatgrass | Heartleaf Arnica | Quaking Aspen |
| Snowberry | Breaded Wheatgrass | Geranium | |
| Snowbush (Buckbrush) | Basin Wildrye | Tall Larkspur | |
| Rose | Blue Wildrye | Big Bluebell | |
| Sagebrush | Columbia Needlegrass | Lupine | |
| Curleaf Mtn. Mahogany | Sedge | Balsomroot | |
| Chokecherry | Letterman Needlegrass | Aster | |
| Barberry | Bluebunch Wheatgrass | Buckwheat | |
| Elderberry | Cheatgrass | Buttercup | |
| Little Rabbitbrush | | Hydrophillum | |

Photo depicts aspen-willow type on the last flank of Lone Mountain. The low-crown, dark green areas are snowberry and chokecherry-willow fields located in swells where snow drifts to form a mesic habitat. Site soils are generally deep, dark, fertile and cold.

(5) Subalpine-Woodland Zone

This vegetative zone is found on the highest ranges in the subject area. The best examples of the type are in the Rubies, Jarbidge, Mahoganies, Independence, Cherry Creek and Pilot Mountains. The zone lies between 8,000' (north slopes) and 10,500' elevation in a rainfall belt of 25" to 45". The main vegetative types within the zone are:

1. Conifer: Limber Pine-Shrub-Grass
   White Fir-Shrub-Grass
   Bristlecone Pine (Some small areas in the Rubies.)

2. Meadow Types: Wet Meadows and Dry Meadows

3. Shrub Type: Willow-Ligusticum-Potentilla

4. Tall Forb Type: Aconogonum-Bluebell-Senecio-Grass

The more important species of this vegetative zone are listed as follows:

| Shrubs | Grasses | Forbs | Trees |
|---|---|---|---|
| Low Sagebrush | Slender Wheatgrass | Heart-leaf Arnica | Limber Pine |
| Whortleberry | Sedge | Skunk Cabbage | White Bark Pine |
| Willow | Alpine Timothy | Penstemon | Bristlecone Pine 1/ |
| Potentilla | Hairgrass | Monkey Flower | White Fir |
| Ligusticum | Columbia Needlegrass | Aster | Engelmann Spruce 2/ |
| Oregon Grape | Mtn. Bromegrass | Sneeze Weed | |
| Snowberry | Sheep Fescue | Senecio | |
| | Skyline Bluegrass | Knotweed | |
| | Wire Rush | Aconogonum | |
| | | Cone Flower | |
| | | Geum | |
| | | Tall Bluebell | |
| | | Lupine | |
| | | Horse Mint | |
| | | Fern | |

1/ Infrequent, small, isolated sites in the Ruby Mountains near Pearl Peak.

2/ Rare in the subject area. Known in small sites on the Pilot Peak and Cherry Creek Range.

(6) Alpine Zone

These are small areas intermixed with the subalpine zone and occur primarily above 11,000' elevation on shallow soil. Loope (1969) reported the Ruby Mountains has the richest alpine flora of the mountains in the Great Basin. There are 41 Arctic species reported in this mountain area.

The most frequent plants are listed as follows:

| Shrubs | Grasses | Forbs |
|---|---|---|
| Dwarf Willow | Sedge | Geum |
| Shrubby Cinquefoil | Slender Wheatgrass | Silene |
| | Arctic Bluegrass | Phlox |
| | Sheep Fescue | Everlasting |

The photo depicts vegetative-environmental conditions for the subalpine-alpine vegetative zone. (USFS Photo.)

A more complete vegetative inventory may be found in BLM District URAs, the Ruby Lake Wildlife Refuge vegetative inventory and the Humboldt National Forest Flora of the Ruby-East Humboldt Mountains (Lewis) 1971.

## 2. Animal Life

The subject area supports a large and varied crossection of animal life forms. The distribution, abundance and species are greatly influenced by the eight vegetative zones discussed in the foregoing section.

### a. Aquatic Animals

Wet meadows, streams, reservoirs, ponds and marsh areas provide excellent habitat for numerous species of waterfowl, amphibians, fish, invertebrates and mammals. The major crucial habitat area is located in Ruby Valley and is comprised of the Franklin Lake marsh and the Ruby Wildlife Refuge marshes. These areas provide the major habitat for waterfowl in the subject area and support approximately 1% of the entire canvasback duck nesting pairs in North America. The refuge had a total of 7,136,226 waterfowl use days alone in 1972. The wet meadow areas are important nesting areas for the Greater Sandhill Crane. Whooping Crane has been seen in the area.

Very little is known about the other major streams, reservoirs and meadowlands of the subject area.

A listing of more important aquatic species of the subject area is as follows:

| Mammals | Birds | Reptiles and Amphibians | Invertebrates |
|---|---|---|---|
| Muskrat | Mallard Duck | Salamander sps. | Dragonfly |
| Mink | Teal Duck | Toad sps. | Damselfly |
| Northern Water Shrew | Widgeon Duck | Leopard Frog | Nymph |
| Raccoon | Goldeneye Duck | Spotted Frog | Midge Larva |
| River Otter | Pintail Duck | Western Yellow-bellied Racer | Water Boatsman |
| Richardson Ground Squirrel | Gadwall Duck |  | Backswimmer |
| Mountain Vole | Canvasback Duck | Valley Garter Snake | Predaceous Beetle |
| Western Jumping Mouse | Redhead Duck |  | Water Strider |
| Beaver | Lesser Scoup Duck | Desert Night Snake | Daphnia |
|  | Merganser Duck |  | Mayfly |
|  | Ruddy Duck | Rubber Boa | Stonefly Nymph |
|  | Coot | Common Garter Snake | Caddisfly |
|  | Canada Goose |  | Annelid sps. |
|  | Common Snipe |  | Snail sps. |
|  | Belted Kingfisher |  | Scude sps. |
|  | Rail |  |  |
|  | Loon |  |  |
|  | Tern |  |  |
|  | Gull |  |  |

For further information, refer to the Ruby Lake National Wildlife Refuge species lists and USFS species inventories. District species lists at the end of this section are nearly complete for the animals of the subject area.

Fish life of the subject area is identified in the tables on p. 43(a) and Map Illustration VIII.

As previously discussed during the hydrologic presentation, stream habitat varies widely over the area. In general, waters of the Snake system are cold, swift and clear and with such characteristics, provide excellent trout habitat. Only the lower segments of Salmon Falls River and Goose Creek have marginal trout waters.

The Humboldt system has excellent trout habitat only in the higher reaches. The middle and lower reaches deteriorate rapidly and support little more than carp and other rough-fish species. The Thousand Springs drainage is closely related to the Humboldt in trout habitat.

Of the closed basin areas, the Ruby Wildlife Refuge and the Ruby Mountain Lakes have the better fish habitat. Most other areas are small, restricted and provide marginal fish habitat subject to destructive flash-flooding.

Endangered aquatic species are:

1. Lahontan Cutthroat Trout - Humboldt System
2. Arctic Grayling - Smith Lake.

Unique Aquatic Specie are:

1. Red-banded Cutthroat Trout - Chino and Winters Creeks.

The locations of these crucial habitat areas are shown on Illustration Map VIII.

b. Terrestrial Animals

(1) Domestic Stock and Horses

Rangeland of the subject area supports several thousand cattle, sheep and horses. Elko County has significantly more livestock than any other county of the state. For specific forage sales and animal licenses, refer to District URAs, USFS and Ruby Refuge records.

There are numerous bands of free-roaming feral or wild horses within the subject area. These are primarily located in the Elko District area and in the South Ruby Mountains near Overland Pass. Present numbers are estimated at approximately 4,100 (USFS and BLM), and a complete inventory is not planned pending completion of the claiming authorized by the Wild and Free-Roaming Horse or Burro Act of 1971, PL 92-195. The Map Illustration IX shows general location of these animals.

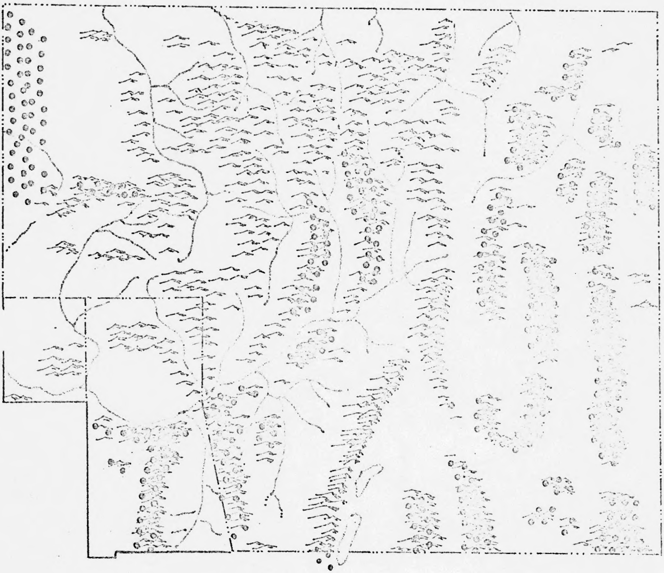
As the claiming process, which allows ranchers to claim and remove their private horses continues, horses will be removed from many of these areas and thinned out in other areas. When this process is completed, wild and free-roaming horse areas will be identified and a management plan for their protection can be developed. At present, these animals are increasing at a rate of approximately 15% to 20% annually.

(2) Wildlife

(a) Mammals

The most numerous large animal of the subject area is the mule deer. An estimated 100,000 mule deer inhabit the Elko District during the year. In 1973, 8,100 deer were harvested. They are seasonally abundant throughout most of the mountainous areas of the subject area. The north-south oriented mountain ranges typical of the Great Basin and most of the area serve as migration corridors for many thousands of deer which winter in the mountains of the central, east central and southern ranges of the area. See Illustration X for deer ranges.

ILLUSTRATION IX



PROBABLE OCCURENCE OF WILD HORSES

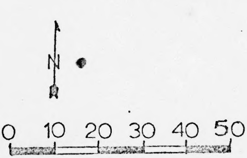
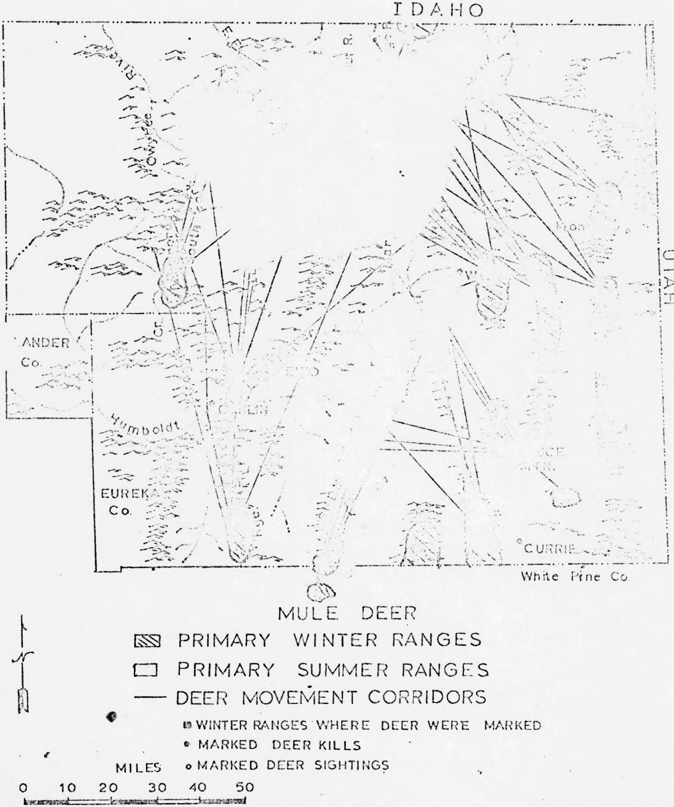


ILLUSTRATION X



MULE DEER

Deer commonly concentrate in winter ranges which are normally much less extensive than summer ranges. It is winter ranges where disturbance to vegetation may result in considerable impact upon wintering deer. Deer use on these areas may be up to 128 deer use days per acre.

The most critical wintering areas are typified by big sage-black sage, bitterbrush association. These areas are located in Owyhee Canyon* below Wildhorse Reservoir; the Island* near the East Fork Jarbidge River; Ela Dee*-Granite Mountains at Contact; Dairy Valley, north of Montello; Toanas, west of Montello; Goshute Mountains; Pequop Mountains*; Spruce Mountain*; Dolly Varden Mountains; Cherry Creek Mountains; Medicine Range; South Ruby Range*; Bald Peak; Wood Hills*; Tuscarora Mountains; Elko-Carlin Hills; Sulphur Springs Range*; and Cortez Mountains.

*Denotes crucial winter range area.

Summer ranges are located primarily on the National Forest areas. In general, summer ranges are not a critical factor in the animal's distribution and survival.

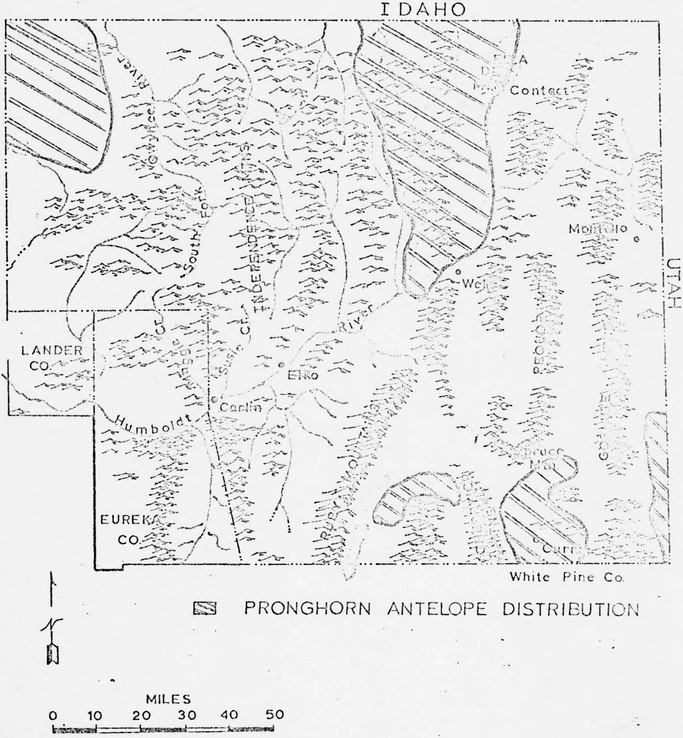
The mountain goat has been reintroduced into the Ruby Mountains area. The small band is located near the heads of Lamoille and Long Canyons.

Antelope are found in the valleys and benchlands of the subject area in several places. The total numbers are estimated to be 500 animals for Elko County. See Illustration XI for antelope ranges.

Antelope seem to prefer certain areas or range types for fawning, but will readily depart from this to achieve a certain degree of seclusion. Fawning normally occurs in May and June.

Antelope generally do best on native ranges with a diversity of vegetative types, where average height is less than 24".

ILLUSTRATION #I



The important antelope ranges within the subject area are the Owyhee Desert; the east Island-Pole Creek area, east of Jarbidge; the O'Neil Basin-Brown's Bench, west of Jackpot; the Snake Mountains and bench areas; the Tabor Creek Flat; the East Ruby Valley; the Goshute-South Steptoe Valley and the Ferber Wash Flat along the Utah state line. Antelope are reported in smaller bands in Pine Valley and Pilot Valley.

Total annual permits for the three major hunt areas combined total 35 (1974 season). Hunter success has averaged approximately 80%.

Predators common within the subject area are the coyote, bobcat, badger, weasel, mink, cougar, and kit fox. Only the cougar, mink and kit fox are restricted in range by habitat or food supply.

The mink is closely associated with aquatic habitat and is, therefore, found in significant numbers around stream, marsh and reservoir areas.

The cougar depends heavily on deer for food during much of the year and tends to follow migrating herds. This predator is also very troublesome to stockmen of the area through depredation of cattle, sheep and colts. The important habitats are rough mountainous areas during the summer months and rough or dense tree-covered foothills during the winter months.

The kit fox is found only in the southeast desert valleys and in limited numbers. This diminutive member of the fox family is protected by state law.

The area has a wide variety of small mammals and rodents. These animals provide food for the predacious mammals, birds and reptiles. Common animals of the group are ground squirrel, mice, porcupine, black-tailed jackrabbit, cottontail rabbit and pigmy rabbit. At higher elevations, the snowshoe hare, pika and marmot are found with many of the above animals.

Several of the less common mammals within the area are the grey fox, raccoon, otter and skunk. The area supports a variety of microtine species common to cold desert, sagebrush-grass, pinyon-juniper, subalpine, alpine and marsh zones. For complete

listings, see the mammal lists in the Refuge, Forest Service and BLM offices.

(b) Birds

The largest group of birds in the area are the passerine songbirds with the most common species being the sage sparrow, horned lark and bluebird.

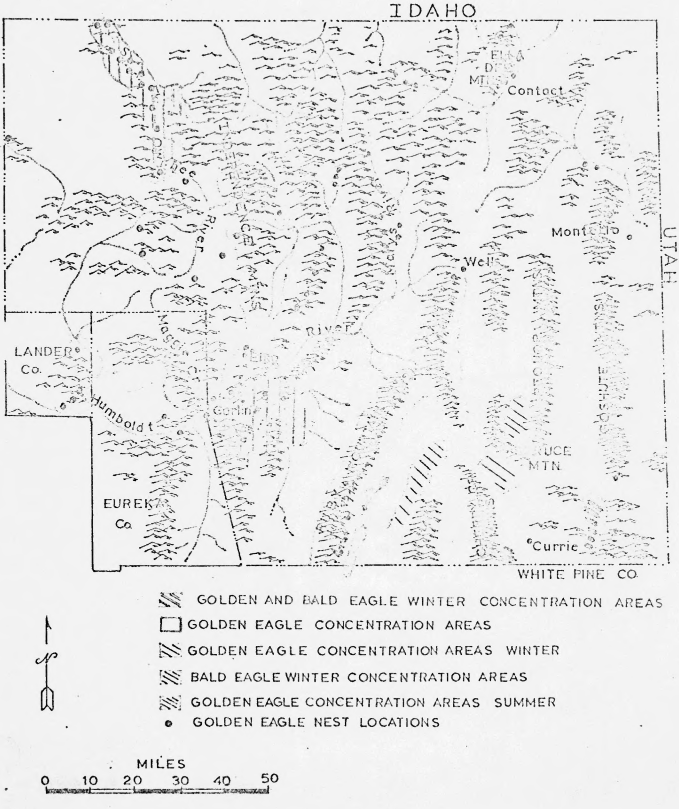
The scavenger is limited to primarily four species. These are the magpie, raven, crow and turkey vulture. They are distributed across the entire subject area, but most commonly found near agricultural and ranching areas.

There are several species of raptors in the subject area. The more common members of this group are the sharp-shinned hawk, Cooper's hawk, red-tailed hawk, Swainson's hawk, rough-legged hawk, ferruginous hawk, marsh hawk, goshawk, osprey, prairie falcon, sparrow hawk, golden eagle, bald eagle, peregrine falcon, great-horned owl, burrowing owl, long-eared owl, short-eared and saw-whet owl. The area between Spruce Mountain-Delcer Butte and Dolly Varden Flat has been identified as an important wintering area for the endangered Southern bald eagle. During the winters of 1972 and 1973, 20 birds were inventoried in these areas by the Bureau of Sports Fisheries and Wildlife.

Golden eagles can be found throughout the subject area with concentrations along the Ruby Mountains, Independence Mountains and stream courses. Eagles select nesting sites that are usually within 1 mile radius of some riparian or aquatic vegetation. This behavior can be correlated with the increased food supply associated with these areas. These large raptors are closely associated with the distributions and concentrations in the valleys during the winter months of black-tailed jackrabbits and ground squirrels, their principal food source. See Illustration XII for eagle concentration and nesting area.

The endangered species, prairie and peregrine falcons, are primarily located in the more primitive

# EAGLE INVENTORY
# ELKO DISTRICT



▨ GOLDEN AND BALD EAGLE WINTER CONCENTRATION AREAS
☐ GOLDEN EAGLE CONCENTRATION AREAS
▨ GOLDEN EAGLE CONCENTRATION AREAS WINTER
▨ BALD EAGLE WINTER CONCENTRATION AREAS
▨ GOLDEN EAGLE CONCENTRATION AREAS SUMMER
● GOLDEN EAGLE NEST LOCATIONS

areas of the subject area and important habitats are the rough canyon areas of the Owyhee, Bruneau, Jarbidge and Salmon Falls Rivers. The principal food for these birds of prey are the Townsend ground-squirrel and other small rodents. Very little is known concerning these birds in the subject area.

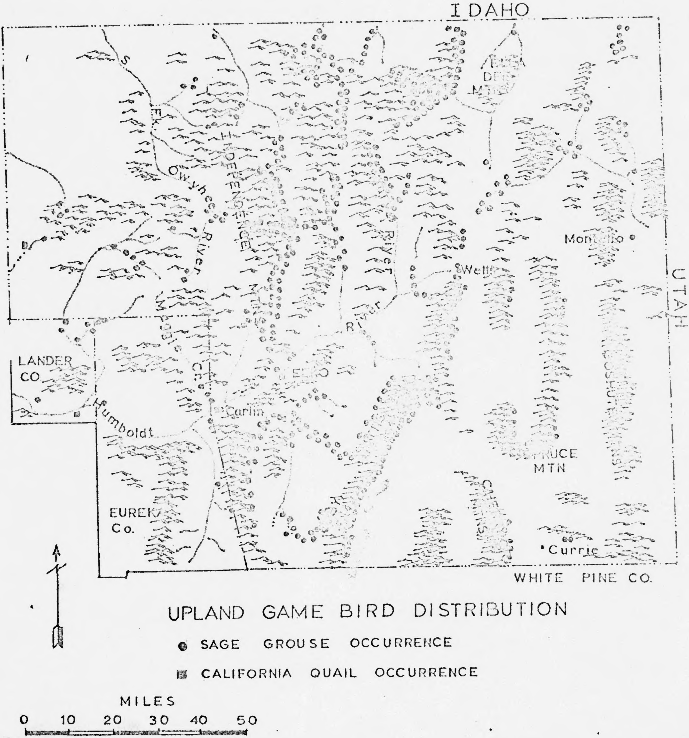
Game birds within the area are sage grouse, blue grouse, chukar partridge, Hungarian partridge, mourning dove, and a small population of California quail. A limited number of Himalayan snow partridge has been introduced in the Ruby Mountains. Another group was released during the past year with hopes of establishment.

Illustration XIII shows the general distribution of upland game birds in the subject area. Illustration XIV, map and attached legal description, shows the crucial sage grouse strutting grounds. Destruction of these areas could eliminate a colony of birds in the area through disturbance of mating habit.

There is a common misconception that the vast uninhabited areas of Nevada are stocked with generous populations of upland game. The reality in these areas is that those factors, limiting factors, which preclude high density human populations are also normally limiting factors for resident game birds. Environmental factors result in 62% or 68,000 square miles of the 110,500 square miles in the state inhabited by any upland game bird on a permanent resident basis. Of the occupied habitat, the sagebrush type is by far the most extensive. It is this type that includes approximately 29,000 square miles of the northern and eastern parts of the state. The sagebrush type provides food and cover for sage grouse and to a lesser extent blue grouse and chukar. With the exception of chukars and sage grouse, all other upland game species together occupy no more than about five percent of the suitable upland game bird habitat in Nevada. For upland game bird occurrence in the Elko District, refer to Illustration No. XIII.

Some of the areas included as suitable habitat may be occupied regularly on a seasonal basis, for example,

ILLUSTRATION XIII



UPLAND GAME BIRD DISTRIBUTION

ILLUSTRATION XIV

## SAGE GROUSE STRUTTING GROUNDS

| SITE NAME | LAND STATUS | LOCATION |
|---|---|---|
| Elko Co. #2 | NRL | T. 26N, R. 61E, Sec. 14-23 |
| Big Canyon | NRL | T. 26N, R. 64E, S. 6: SE 1/4 |
| Sadler Ranch | NRL | T. 27N, R. 55E, S. 24: NW 1/4 |
| Elko Co. #1 | NRL | T. 27N, R. 61E, S. 36 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 12: N 1/2 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 12: S 1/2 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 13: NE 1/4 |
| So. Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 13: SE 1/4 |
| McDermitt Bench #1 | NRL | T. 27N, R. 64E. S. 29: NW 1/4 |
| McDermitt Bench #2 | NRL | T. 27N, R. 64E, S. 30: SW 1/4 |
| Pearl Creek | NRL | T. 28N, R. 56E, S. 26 |
| Elko Co. #3 | NRL | T. 28N, R. 62E, S. 30-31 |
| So. Cottonwood Bench #1 | NRL | T. 28N, R. 63E, S. 14: SE 1/4 |
| So. Cottonwood Bench #2 | NRL | T. 28N, R. 63E, S. 23: NW 1/4 |
| So. Cottonwood Bench #3 | NRL | T. 28N, R. 63E, S. 24: NW 1/4 |
| So. Cottonwood Bench #4 | NRL | T. 28N, R. 63E. S. 25: NW 1/4 |
| Green Mtn. Creek | FS | T. 29N, R. 57E, S. 31: SW 1/4 |
| Elliot Ranch | NRL | T. 30N, R, 53E, S. 11 |
| Dixie Flat | NRL | T. 30N, R. 53E, S. 12: SE 1/4 |
| Zunino Creek | NRL | T. 30N, R. 56E, S. 27: NW 1/4 |
| Kelly Store | NRL | T. 30N, R. 59E, S. 19: NW 1/4 |
| South Spruce | NRL | T. 30N, R. 64E, S. 28: NW 1/4 |
| Bullion Road | NRL | T. 31N, R. 54E, S. 16: NW 1/4 |
| Stonier Ranch | NRL | T. 31N, R. 59E. S. 10: NE 1/4 |
| Loading Shute | NRL | T. 31N, R. 61E, S. 6: N 1/2 |
| High Beach | NRL | T. 31N, R. 61E, S. 7: SE 1/4 |
| 10 Mile Road | NRL | T. 32N, R. 55E, S. 1 : NW 1/4 |
| Dixie Creek | NRL | T. 32N, R. 54E, S. 23: SE 1/4 |
| E. White Flats | NRL | T. 32N, R. 55E, S. 16: SW 1/4 |
| W. White Flats | NRL | T. 32N, R. 55E, S. 20: SW 1/4 |
| Sheep Creek | NRL | T. 32N, R. 56E, S. 24: NE 1/4 |
| Round Meadow | NRL | T. 32N, R. 60E, S. 24: SE 1/4 |
| Long Ridge | NRL | T. 32N, R. 60E, S. 24: SW 1/4 |
| Round Knoll | NRL | T. 32N, R. 61E, S. 7: NE 1/4 |
| Road Junction | NRL | T. 32N, R. 61E. S. 7: SW 1/4 |
| Second Beach | NRL | T. 30N, R. 62E, S. 1: W 1/2 |
| S. Clover Valley | NRL | T. 32N, R. 62E, S. 2: NE 1/4 |
| First Beach | NRL | T. 32N, R. 62E, S. 2: NW 1/4 |
| Mile 39 | NRL | T. 32N, R. 62E, S. 6: SW 1/4 |

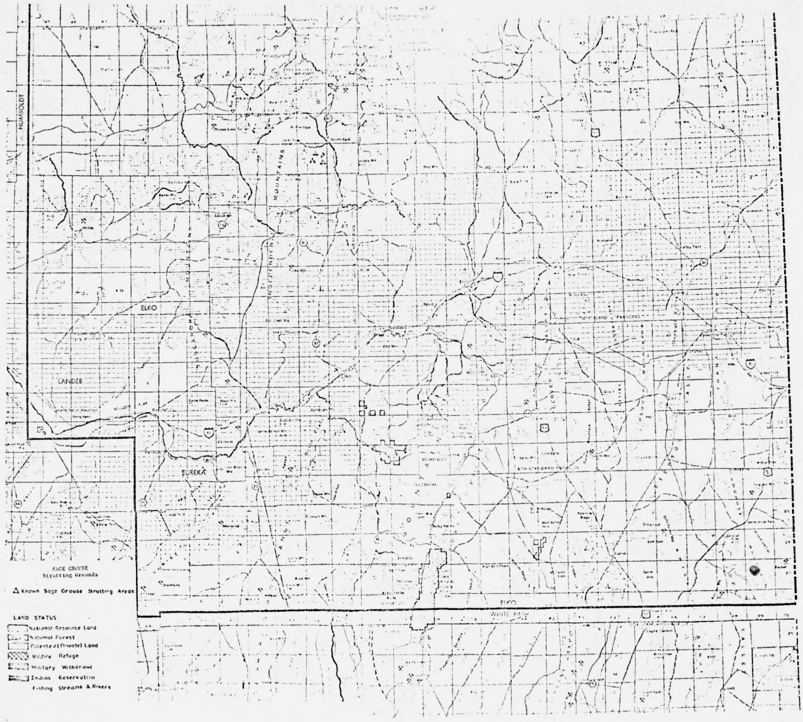
| | | |
|---|---|---|
| Moffat Reservoir | NRL | T. 33N, R. 56E, S. 6: NW 1/4 |
| Indian Reseeding | NRL | T. 33N, R. 56E, S. 31: SW 1/4 |
| Lee Road | NRL | T. 33N, R. 56E. S. 36 |
| Reseeded Area | NRL | T. 33N, R. 61E, S. 31: NW 1/4 |
| Snow Fence | NRL | T. 33N, R. 61E, S. 36: NW 1/4 |
| Warm Creek | NRL | T. 33N, R. 62E, S. 32 |
| Flat Complex | NRL | T. 33N, R. 62E, S. 32: SW 1/4 |
| Ravine Reservoir | NRL | T. 33N, R. 62E, S. 33: SW 1/4 |
| | | |
| ---------- | NRL | T. 34N, R. 52E, S. 21 |
| Elko Summit | NRL | T. 34N, R. 56E, S. 32: SW 1/4 |
| Dry Lake Res. | NRL | T. 34N, R. 57E, S. 18: NE 1/4 |
| ---------- | NRL | T. 34N, R. 57E, S. 33: SE 1/4 |
| | | |
| Izzenhood #2 | NRL | T. 35N, R. 46E, S. 2 |
| Izzenhood #1 | NRL | T. 35N, R. 46E, S. 4 |
| Adobe Summit | NRL | T. 35N, R. 54E, S. 36: NW 1/4 |
| | | |
| Jack Cr. Rd. | NRL | T. 36N, R. 46E. S. 14 |
| 16 Mile Creek | NRL | T. 36N, R. 54E, S. 34: NE 1/4 |
| Dinner Station | NRL | T. 36N, R. 54E, S. 34: NE 1/4 |
| | | |
| N. Six Mile #1 | NRL | T. 37N, R. 46E, S. 28: NW 1/4 |
| Mud Springs | NRL | T. 37N, R. 54E, S. 6 |
| BLM - 28 | NRL | T. 37N, R. 54E, S. 34: SW 1/4 |
| | | |
| Stampede Cr. | NRL | T. 38N, R. 52 E, S.28: SE 1/4 |
| Eagle Rock | NRL | T. 38N, R. 53E, S. 5: NW 1/4 |
| Upper Maggie Cr. | NRL | T. 38N, R. 53E, S. 6: SW 1/4 |
| Lake Creek | NRL | T. 38N, R. 53E, S. 33: SE 1/4 |
| Meadow Cr. | NRL | T. 38N, R. 54E, S. 6: SW 1/4 |
| Reed's Station | NRL | T. 38N, R. 54E, S. 19 |
| McClelland Cr. | NRL | T. 38N, R. 54E, S. 22: NW 1/4 |
| Mary's R. Junct. | NRL | T. 38N, R. 59E, S. 10: SE 1/4 |
| Kundseen Ranch | NRL | T. 38N, R. 61E, S. 1 |
| Hot Springs | NRL | T. 38N, R. 62E, S. 17: SW 1/4 |
| | | |
| Taylor Summit | NRL | T. 39N, R. 53E, S. 32: SE 1/4 |
| Taylor Pass | NRL | T. 39N, R. 53E, S. 33: SE 1/4 |
| Midas Creek | NRL | T. 39N, R. 46E, S. 32: SE 1/4 |
| Ridge Rd. #3 | NRL | T. 39N, R. 48E, S. 1: NE 1/4 |
| Ridge Rd. #2 | NRL | T. 39N, R. 48E, S. 11: SE 1/4 |
| Ridge Rd. #1 | NRL | T. 39N, R. 48E, S. 20: NW 1/4 |
| Packer Ranch | NRL | T. 39N, R. 51E, S. 22: NW 1/4 |
| Tule Seeding | NRL | T. 39N, R. 55E, S. 22 |
| Lambing Shed | NRL | T. 39N, R. 58E. S. 22: NW 1/4 |
| E. Devils Gate | NRL | T. 39N, R. 58E, S. 30: NW 1/4 |
| Ten Mile Hill | NRL | T. 39N, R. 63E, S: 10 |
| Bishop Flat Ridge | NRL | T. 39N, R. 63E, S: 16 |

| | | |
|---|---|---|
| Tuscarora | NRL | T. 40N, R. 51E, S. 25: SE 1/4 |
| Six Mile | NRL | T. 40N, R. 52E, S. 19: SE 1/4 |
| South Owyhee | NRL | T. 40N, R. 52E, S. 29: SE 1/4 |
| Taber Creek | NRL | T. 40N, R. 61E, S. 7 |
| | | |
| Harrington Cr. | NRL | T. 41N, R. 52E, S. 3: SE 1/4 |
| S. Pratt #1 | NRL | T. 41N, R. 54E, S. 12 & 13 |
| | | |
| Winters Creek | NRL | T. 42N, R. 48E, S. 36: NE 1/4 |
| Delaware | NRL | T. 42N, R. 54E, S. 1 |
| Delaware #2 | NRL | T. 42N, R. 55E, S. 2: SW 1/4 |
| East Owyhee | NRL | T. 42N, R. 55E, S. 8: SE 1/4 |
| West Beaver #2 | NRL | T. 42N, R. 56E, S. 8: SE 1/4 |
| West Beaver #1 | NRL | T. 42N, R. 56E, S. 9: SE 1/4 |
| West Beaver #3 | NRL | T. 42N, R. 56E, S. 18: SE 1/4 |
| Harris | NRL | T. 42N, R. 65E, S. 14: NE 1/4 |
| | | |
| Sheep Cr. | NRL | T. 43N, R. 52E, S. 34: NE 1/4 |
| Jack Cr. | NRL | T. 43N, R. 55E, S. 17 |
| ~~Crooked Cr.~~ | ~~NRL~~ | ~~T. 43N, R. 56E. S. : NE 1/4~~ |
| Mt. Ichabod | NRL | T. 43N, R. 56E, S. 25: SE 1/4 |
| Mason | NRL | T. 43N, R. 56E, S. 36: NE 1/4 |
| | | |
| Hedriks Cr. #1 | NRL | T. 44N, R. 55E, S. 20 |
| Hendriks Cr. #2 | NRL | T. 44N, R. 55E, S. 21: SW 1/4 |
| Cattleguard | NRL | T. 44N, R. 55E, S. 28: SW 1/4 |
| Wildhorse Meadow | NRL | T. 44N, R. 55E, S. 29: SE 1/4 |
| Gold Creek | NRL | T. 44N, R. 56E, S. 7: SE 1/4 |
| Cottonwood Cr. Bench | NRL | T. 44N, R. 60E, S. 3:SW 1/4 |
| N. Camp Cr. Bench | NRL | T. 44N, R. 60E, S. 9: NE 1/4 |
| E. Willow Spring | NRL | T. 44N, R. 60E, S. 13: NW 1/4 |
| S. Camp Creek #1 | NRL | T. 44N, R. 60E, S. 14: SE 1/4 |
| N. Willow Spring | NRL | T. 44N, R. 60E, S. 16: SE 1/4 |
| S.W. Camp Cr. | NRL | T. 44N, R. 60E, S. 17: NE 1/4 |
| Willow Springs | NRL | T. 44N, R. 60E, S. 21: NE 1/4 |
| S. Camp Creek #2 | NRL | T. 44N, R. 60E, S. 24: NW 1/4 |
| East Fork | NRL | T. 44N, R. 60E, S. 29: SE 1/4 |
| Gilmer Ranch | NRL | T. 44N, R. 60E, S. 17 |
| | | |
| Airport | FS | T. 45N, R. 53E, S. 6: NW 1/4 |
| Haystack | FS | T. 45N, R. 54E, S. 17: NE 1/4 |
| Allegheny | FS | T. 45N, R. 54E, S. 20: NE 1/4 |
| Chicken Creek | NRL | T. 45N, R. 55E, S. 33 |
| Sunflower | NRL | T. 45N, R. 55E, S. 36 |
| Goat Cr. Table | NRL | T. 45N, R. 60E, S. 13: NE 1/4 |
| South Buckhorn | NRL | T. 45N, R. 61E, S. 5: SE 1/4 |
| Canyon Cr. Bench | NRL | T. 45N, R. 61E, S. 20: NW 1/4 |
| Twin Meadows | NRL | T. 45N, R. 62E, S. 17: NE 1/4 |

|  |  |  |
|---|---|---|
| Willow Cr. Ridge | FS | T. 46N, R. 61E, S. 11 |
| Helsley Ranch | NRL | T. 46N, R. 62E, S. 4 |
| Plantation | NRL | T. 46N, R. 62E, S. 17 |
| Bald Ridge | NRL | T. 46N, R. 62E, S. 33 |
| Milligan Cr. #2 | NRL | T. 46N, R. 67E, S. 5: NE 1/4 |
| Little Goose Cr. | NRL | T. 46N, R. 68E, S. 19: NE 1/4 |
|  |  |  |
| Hawes Creek | FS | T. 47N, R. 62E, S. 19: NW 1/4 |
| Wilson Creek | NRL | T. 47N, R. 62E, S. 31 |
| Wilson Ranch | NRL | T. 47N, R. 62E, S. 32: NW 1/4 |
| Gully Ranch | NRL | T. 47N, R. 62E, S. 33 |
| Section 6 | NRL | T. 47N, R. 63E, S. 6: NE 1/4 |
| Brown's Bench #1 | NRL | T. 47N, R. 63E, S. 11: NW 1/4 |
| Jeep Trail | NRL | T. 47N, R. 63E, S. 13: NE 1/4 |
| Brown's Bench #2 | NRL | T. 47N, R. 63E, S. 14: NW 1/4 |
| Brown's Bench #3 | NRL | T. 47N, R. 63E, S. 14: SW 1/4 |
| Cottonwood Cr. Bench #1-7 | NRL | T. 47N, R. 63E, S. 22-23 |
| So. Cottonwood Cr. Bench #1 | NRL | T. 47N, R. 63E, S. 24: NE 1/4 |
| So. Cottonwood Cr. Bench #2 | NRL | T. 47N, R. 63E, S. 24: S 1/2 |
| So. Cottonwood Cr. Bench #7 | NRL | T. 47N, R. 64E, S. 5: SE 1/4 |
| So. Cottonwood Cr. Bench #4 | NRL | T. 47N, R. 64E, S. 9: SE 1/4 |
| So. Cottonwood Cr. Bench #5 | NRL | T. 47N, R. 64E, S. 17: SE 1/4 |
| So. Cottonwood Cr. Bench #3 | NRL | T. 47N, R. 64E, S. 19: SW 1/4 |
| S. Cottonwood Cr. Bench #6 | NRL | T. 47N, R. 64E, S. 21: SW 1/4 |
| Grassy Mtn. | NRL | T. 47N, R. 64E, S. 31: W 1/2 |
| Rancho Grande | NRL | T. 47N, R. 65E, S. 25 |
| Cow Creek | NRL | T. 47N, R. 65E, S. 36: SE 1/4 |
| W. Basin Draw #1 | NRL | T. 47N, R. 66E, S. 2: SE 1/4 |
| Horse Creek #2 | NRL | T. 47N, R. 66E, S. 10: NW 1/4 |
| W. Basin Draw #3 | NRL | T. 47N, R. 66E, S. 11: NW 1/4 |
| W. Basin Craw #4 | NRL | T. 47N, R. 66E, S. 11: SW 1/4 |
| Indian Mike Cr. | NRL | T. 47N, R. 66E, S. 12: NW 1/4 |
| Indian Mike Cr. | NRL | T. 47N, R. 66E, S. 12: SW 1/4 |
| W. Basin Draw #6 | NRL | T. 47N, R. 66E, S. 14: NW 1/4 |
| W. Basin Draw #5 | NRL | T. 47N, R. 66E, S. 15: NE 1/4 |
| Horse Creek #3 | NRL | T. 47N, R. 66E, S. 15: SW 1/4 |
| Horse Creek #5 | NRL | T. 47N, R. 66E, S. 15: SE 1/4 |
| Horse Creek #1 | NRL | T. 47N, R. 66E, S. 16: NW 1/4 |
| Indian Mike Creek | NRL | T. 47N, R. 66E, S. 24: SW 1/4 |
| Horse Creek #4 | NRL | T. 47N, R. 66E, S. 28: NE 1/4 |
| Stateline #2 | NRL | T. 47N, R. 67E, S. 2: NW 1/4 |
| Stateline #3 | NRL | T. 47N, R. 67E, S. 2: SW 1/4 |
| Stateline #1 | NRL | T. 47N, R. 67E, S. 3: SE 1/4 |
| Hot Creek #2 | NRL | T. 47N, R. 67E, S. 6: SW 1/4 |
| Indian Mike Creek | NRL | T. 47N, R. 67E, S. 7: NW 1/4 |
| Hot Creek #3 | NRL | T. 47N, R. 67E, S. 7: SE 1/4 |
| Fall Creek #5 | NRL | T. 47N, R. 67E, S. 15: SE 1/4 |
| Fall Creek #3 | NRL | T. 47N, R. 67E, S. 16: SE 1/4 |
| Chicken Spr. #2 | NRL | T. 47N, R. 67E, S. 18: SW 1/4 |
| Chicken Spr. #3 | NRL | T. 47N, R. 67E, S. 19: NE 1/4 |
| Chicken Spr. #1 | NRL | T. 47N, R. 67E. S. 19: SW 1/4 |
| Milligan Creek #7 | NRL | T. 47N, R. 67E, S. 21: NE 1/4 |
| Hot Creek #1 | NRL | T. 47N, R. 67E. S. 6: NW 1/4 |

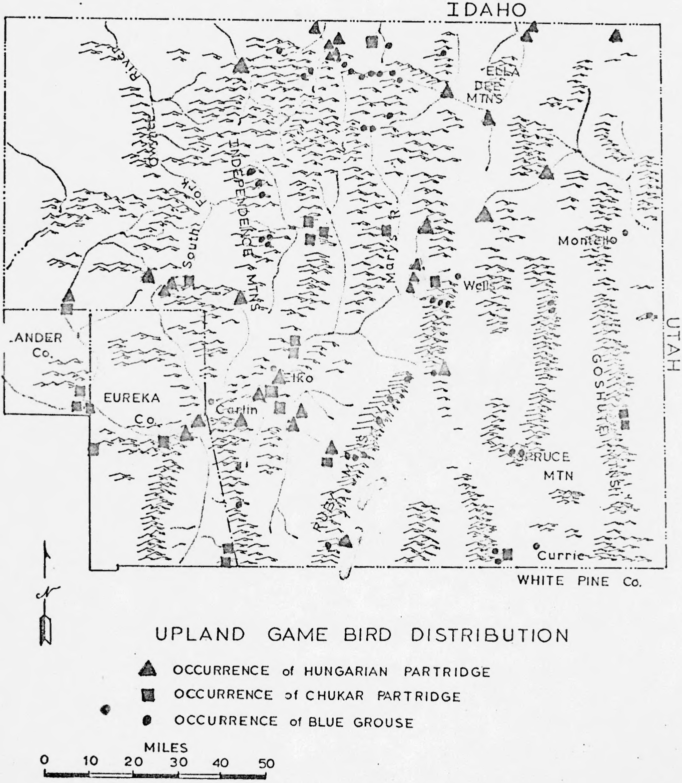
| | | |
|---|---|---|
| Millian Creek #1 | NRL | T. 47N, R. 67E, S. 21 : SE 1/4 |
| Bottom Creek | NRL | T. 47N, R. 67E, S. 30: SE 1/4 |
| Milligan Creek #5 | NRL | T. 47N, R. 67E, S. 34: SW 1/4 |
| Fall Creek #1 | NRL | T. 47N, R. 67E, S. 36: SW 1/4 |
| ------------ | NRL | T. 47N, R. 69E, S. 25 |

| | |
|---|---|
| White Pine County Strutting Grounds | T. 25N, R. 58E, S. 17, 18 & 29 |



SAGE GROUSE
Strutting Grounds

ILLUSTRATION XIII



UPLAND GAME BIRD DISTRIBUTION

the lower elevation sagebrush areas which sage grouse enter for the winter, but abandon during the summer drought. Depending on the amount of fall and winter precipitation, and the resulting development (or lack of development) of essential annual food plants, the occupied ranges of chukar partridge and Gambel quail, and perhaps one or two other species, may expand or contract to a considerable extent.

The major unoccupied habitat types of the Elko District normally consist of twodistinct vegetative zones. One is the shadscale or "cold" desert of western and central Nevada. The second is the pinyon-juniper coniferous forest, most extensively developed in central and eastern Nevada. Refer to Vegetative Map of the Elko District - Illustration VI.

For additional information, refer to the following Bird List for the Elko District.

(c) Reptiles

There are numerous species of lizards and snakes within the subject area.

The most common being the sagebrush lizard, the gopher snake, and the Great Basin rattlesnake. The latter is the only poisonous animal in the subject area.

See attached listing of Reptiles and Amphibians for a complete listing.

(d) Invertebrates

There are numerous species of insects within the District. Common members of the group include ants, beetles, spiders, grasshoppers, flies, mites and worms. These are important food source for birds, fish and small mammals. Further, many small organisms play a vital role in soil building.

(e) Man

The subject area was settled and ranching began during the late 1860s and 70s. There are approximately

250 ranchers within Elko County and major cities are:

Population - 1970 (Final)

Elko Twp. = 8,931 (7,621 = Elko City)
Wells Twp. = 2,196 (1,081 = Wells City)
Carlin Twp. = 1,356 (1,313 = Carlin Town)
Battle Mountain Twp. = 1,856

Smaller Population Areas are:

Mountain City Twp. = 1,125
Jarbidge Twp. = 32
Wendover Twp. = 97 East Line Twp.
Beowawe Twp. = 401
Jackpot - No Data Available
Montello - No Data Available
Lamoille - No Data Available
Crescent Valley - No Data Available
Deeth - No Data Available
Midas - No Data Available.

The primary economic activities are ranching, mining and recreation. Campers, fishermen, hunters and rockhounds are the common interest groups making use of the subject lands, primarily the water areas and National Forest areas.

Populations are variable from very sparce to 2,000/sq. mi. at Elko. County total population is estimated to be 16,910 by the Bureau of Business and Economic Research, University of Nevada, 1973. See attached general population maps.

Nevada Snake River System

Original Fish Fauna of the Nevada Snake System Within Historical Times

SALMON AND TROUT FAMILY (Family Salmonidae)

| | | |
|---|---|---|
| 1. | King Salmon | (Oncorhynchus tshawytscha)1/ |
| 2. | Cutthroat trout | (Salmo clarki) |
| 3. | Rainbow trout | (Salmo gairdneri) |
| 4. | Dolly Varden trout | (Salvelinus malma) |

WHITEFISH FAMILY (Family Coregonidae)

| | | |
|---|---|---|
| 5. | Mountain Whitefish | (Prosopium williamsoni) |

SUCKER FAMILY (Family Catos tomidae)

| | | |
|---|---|---|
| 6. | Biglip sucker | (Catostomus macroheilus) |
| 7. | Bridgelip sucker | (Catostomus columbranus) |

CARP & MINNOW FAMILY (Family Cyprinidae)

| | | |
|---|---|---|
| 8. | Chiselmouth | (Achronheilus alutaceum) |
| 9. | Northern Squawfish | (Phytochocheilus oregonense) |
| 10. | Typical Columbia Redshiner | (Richardsonus balteatus balteatus)2/ |
| 11. | Bonneville Columbia Redshiner | (Richardsonuis balteatus hydrophlox)2/ |
| 12. | Snake River Speckle Dace | (Rhinichthys osculus carringtoni) |

SCULPIN FAMILY (Family Cottidae)

| | | |
|---|---|---|
| 13. | Belding Sculpin | (Cottus beldingii) |

1/ Undoubtedly exinct now.

2/ These two sub-species intergrade in this area.

Fishes Successfully Introduced into the Nevada Snake System

SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 1. Brown trout | (Salmo trutta) |
| 2. Brook trout | (Salvelinus fonitnalis) |

CARP & MINNOW FAMILY (Family Cyprinidae)

| | |
|---|---|
| 3. Asiatic Carp | (Cyprinus carpio) |

Lahontan-Humboldt River System

Original Fish Fauna of the Lahontan River System Wtinin Historical Times.

SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 1. Lahontan Cutthroat Trout | (Salmo clarkii henshawi) |

WHITEFISH FAMILY (Family Coregonidae)

| | |
|---|---|
| 2. Mountain Whitefish | (Prosopium williamsoni) |

SUCKER FAMILY (Family Catostomidae)

| | |
|---|---|
| 3. Tahoe Sucker | (Catostomus tahoensis) |
| 4. Lahontan Mountain Sucker | (Pantosteus lahontan) |
| 5. Cui-ui Lake Sucker | (Chasmistes cujus)(In the lower Truckee River only during the spring spawning run.) |

CARP & MINNOW FAMILY (Family Cyprinidae)

| | |
|---|---|
| 6. Lahontan Redshiner | (Richardsonius egregius) |
| 7. Lahontan Tui Chub | (Siphateles bicolor obesus) |
| 8. Lahontan Speckle Dace | (Rhinichthys osculus robustus) |
| 9. Soldier Meadows Desertfish | (Ermichthys acros) |

SCULPIN FAMILY (Family Cottidae)

| | |
|---|---|
| 10. Belding Suclpin | (Cottus belding) |

Fishes Successfully Introduced Into The Lahontan River System.

SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 1. Brown trout | (Salmo trutta) |
| 2. Rainbow trout | (Salmo gairdneri) |
| 3. Brook Trout | (Salvelinus fontinalis) |

### CARP & MINNOW FAMILY (Family Cyprinidae)

| | |
|---|---|
| 4. Sacramento Blackfish | (Orthodon microlepidotus) |
| 5. Asiatic Carp | (Cyprinus carpio) |

### CATFISH FAMILY (Family Ictaluridae)

| | |
|---|---|
| 6. Channel Catfish | (Ictalurus punctatus) |
| 7. White Catfish | (Ictalurus catus) |
| 8. Black Bullhead | (Ictalurus melas) |
| 9. Brown Bullhead | (Ictalurus nebulosus) |

### TOP MINNOW FAMILY (Family Poeciliidae)

| | |
|---|---|
| 10. Mosquitofish | (Gambusia affinis) |

### PERCH FAMILY (Family Percidae)

| | |
|---|---|
| 11. Yellow Perch | (Perca flavens) |

### SUNFISH FAMILY (Family Centrarchidae)

| | |
|---|---|
| 12. Largemouth Black Bass | (Microplerus salmoides) |
| 13. Smallmouth Black Bass | (Microplerus dolomieui)[3] |
| 14. Bluegill Sunfish | (Lepomis macrochirus) |
| 15. Green Sunfish | (Lepomis cyanellus) |
| 16. Sacramento Perch | (Archoplites interruptus) |
| 17. White Crappie | (Pomoxis annularis) |

Salt Lake System

Original Fish Fauna of the Nevada Bonniville System Within Historical Time. (Thousand Springs Creek)

### SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 1. Utah Cutthroat | (Salmo clarki utah)(Not in Wells Resource Area presently) |

---

[3] Introduced in late 1956 intothe Upper Humboldt River between Elko and Battle Mountain. Plants were mainly made in Palisade and Carlin Canyons.

### SUCKER FAMILY (Family Catostomidae)

| | |
|---|---|
| 2. Utah Sucker | (Catostomus ardens) |
| 3. Bonneville Mountain Sucker | (Pantosteus plalyrhynchus) |

### CARP & MINNOW FAMILY (Family Cyprinidae)

| | |
|---|---|
| 4. Bonneville Columbia Redshiner | (Richardsonius balteatus phdrophlox) |
| 5. Bonneville Speckle Dace | (Rhenichthys sp) |
| 6. Leatherside Chub | (Snyderichthys aliciae) |

### SCULPIN FAMILY (Family Cottidae)

| | |
|---|---|
| 7. Bonneville Baird Sculpin | (Cottus bairdi semiscaber) |

Fishes Successfully Introduced Into The Nevada Bonneville System.

### SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 1. Rainbow trout | (Salmo gairdneri) |
| 2. Brown trout | (Salmo trutta) |
| 3. Brook trout | (Salvelinus ponitinalis) |

### CARP & MINNOW FAMILY (Family Cyprinus carpio)

| | |
|---|---|
| 4. Asiatic Carp | (Cyprinus carpio) |

### SUNFISH FAMILY (Family Centrachidae)

| | |
|---|---|
| 5. Largemouth Bass | (Micropterus salmoides) |
| 6. Sacramento Perch | (Archoplites interruptus) |
| 7. Blue Gill Sunfish | (Lepomis macrochirces) |

Closed Basin Area

Native Fishes of the Enclosed Basins of the Currie Planning Unit.

### CARP & MINNOW FAMILY (Family Cyprinidae)

| | |
|---|---|
| Rhinichthys osculus oligoporous | 9.5 soot wells - Warm Springs |
| Rhinichthys osculus lethoporous | Independence Valley |
| Gila bicolor isolata | Independence Valley |
| Relictus solitarius | Franklin & Ruby Marshes |

## Fishes Successfully Introduced into the Enclosed Basins of the Wells Resource Area.

### CARP & MINNOW FAMILY

| | |
|---|---|
| 1. Speckle Dace | (*Rhinichthys osculus robustus*) |
| 2. Carp | (*Cyprinus carpio*) |

### SUNFISH FAMILY (Family Centrarchidae)

| | |
|---|---|
| 3. Largemouth Black Bass | (*Micropterus salmoides*) |
| 4. Smallmouth Black Bass | (*Micropterus dolomieui*) |

### SALMON & TROUT FAMILY (Family Salmonidae)

| | |
|---|---|
| 5. Rainbow Trout | (*Salmo gairdneri*) |
| 6. Brook Trout | (*Salmo fontenalis*) |
| 7. Golden Trout | (*Salmo aquabonita*) (Ruby Mtn. Lakes) |

### GRAYLING FAMILY (Family Thymallidae)

| | |
|---|---|
| 8. Axetic Grayling | (*Thymallus signifer*) (Ruby Mtn. Lakes) |

Deer mous ry common. Nocturnal. All habitats.
Pinyon mou. Rocky areas among Juniper trees. Southeast corner of the County.
Northern grasshopper mouse. District-wide. Upper Sonoran life-zone.
Desert woodrat. Rocky areas. Lower and upper Sonoran life-zones. East edge of District.
Bushytail woodrat. Boreal life-zone. Common. Builds nests of sticks.
Mountain vole. Common throughout the District. Upper Sonoran life-zone. Lives in grass areas. Makes runway. Springs and meadows.
Longtail vole. Herbaceous vegetation. Boreal life-zones down to Transition life-zone.
Sagebrush vole. Transition and upper Sonoran life-zone. Among sagebrush of uniform height and well sheltered. District-wide.
Muskrat. Aquatic. Common. Often builds nests in water.
Black rat. Towns.
House mouse. Houses.
Western jumping mouse. Boreal life-zone. Live near streams. West half of District.
Porcupine. District-wide.

RABBIT FAMILY:
White-tailed jackrabbit. Upper Sonoran, Transition, and Boreal life-zones. Edges of meadows.
Black-tail jackrabbit. Very common throughout the District.
Mountain cottontail. District-wide. Near streams and meadows.
Pygmy rabbit. County-wide. Areas of big sagebrush.

DEER:
Mule deer. District-wide in mountain ranges. Common.

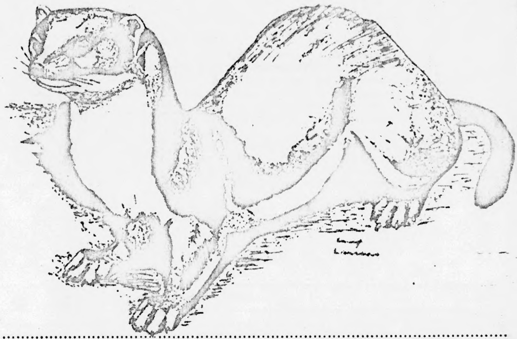
ANTELOPE:
Antelope. Most of District. Open rangelands.

MOUNTAIN GOAT:
Mountain goat. Introduced into Ruby Mountains. Status unknown.

MARCH 3, 1849

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Elko, Nevada
February 1971



# MAMMALS of the ELKO BLM DISTRICT

*Looking around, you'll find some of the most scenic areas in Nevada, in the Elko District of the Bureau of Land Management. The Elko District covers the northeast corner of Nevada and includes over 12 million acres of which 7.4 million are BLM public lands -- YOUR LANDS.*

*Because of the mountain ranges and valley bottoms, there is a wide variety of wildlife habitat and animal life.*

*This list was designed to help you, whether resident or visitor, serious student or casual observer, to better appreciate nature's offerings.*

*Welcome to the Elko District - help us, yourself, and Johnny Horizon by leaving nothing but your footprints!*

## ANNOTATED LIST OF THE MAMMALS OF THE ELKO BLM DISTRICT

The following mammal list contains 63 species, which have been recorded in this county. Past records indicate Bighorn Sheep and the Wolf were present in Elko County, but they are extinct in this area today.

This list was compiled from Hall's "Mammals of Nevada" and with cooperation from the Nevada State Museum, Nevada Department of Fish and Game, and U.S. Forest Service.

* * * * *

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SHREWS:

Merriam shrew. Dry areas. Sagebrush. Drier areas than other shrews.
Vagrant shrew. Very common. Banks of streams or marshy places.
Northern water shrew. Cold mountain streams and their borders. Upper Sonoran and Canadian life-zone.

BATS:

Little Brown Myotis. Found throughout the District, often near water.
Long-eared Myotis. Transition life-zone. Not a colonial nester. Uses niches in rocks, trees, or building to roost.
Long-legged Myotis. Tree areas and near streams, caves and ponds.
Small-footed Myotis. Upper Sonoran life-zone, more rarely - Transition life-zone. Uses niches in rocks, trees, buildings to roost. Not a colonial nester.
Big Brown Bat. Tree areas. Roosts in caves, buildings, Common. Colonial. Caves preferred.
Western Big-eared Bat. Maybe in Elko. Colonial or single cave dweller.
* Spotted Bat. Very rare in State - may be located in District. Please report any findings.

RACCOON:

Raccoon. Northern two-thirds of Elko County. Common along streams.

WEASEL FAMILY:

Short-tail weasel. In mountains and along streams. Throughout the District. Not in desert areas. Tan in summer/ermine in winter.
Long-tail weasel. Boreal life-zones. Lower elevations in winter.
Mink. Water Areas, N1/2 of District. Dens are holes in ground, under logs, rock crevices. Excellent swimmer.
River otter. Water. Makes mud slides, excellent swimmer.
Badger. All of county above Lower Sonoran life-zone. Common.
Spotted skunk. Nocturnal. Likes rocky areas. District-wide. Canyon bottoms.
Striped skunk. Uncommon along streams, irrigated areas. Usually nocturnal. Sonoran life-zone - District-wide. Small populations.

* On list of rare and endangered species for United States.

DOG FAMILY:

Coyote. Throughout entire District.
Red Fox. Uncommon. Mountains in the vicinity of Wells. Not known to occur in Elko County in recent years.
Gray Fox. In upper Sonoran life-zone. Occur in foothills. SE ¼.
Kit Fox. In or below upper Sonoran life-zone. Occur in lower, sandy parts of valleys. E ¼ of county.

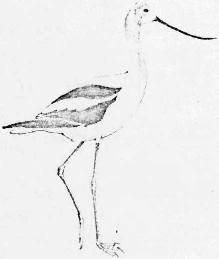
CAT FAMILY:

Mountain lion. Uncommon. Mountain areas.
Bobcat. Rocky areas at mouths of canyons. Rocky areas. More nocturnal than diurnal.

RODENT FAMILY:

Yellowbelly marmot. Aestivate, early summer. Rocky areas canyons. County wide. Colonial.
Townsend ground squirrel. District-wide. Sagebrush covered benches above creek bottoms. Upper Sonoran life-zone.
Richardson ground squirrel. Meadowland. W ½ of District.
Belding ground squirrel. Transition and higher life-zone. Meadow-land and borders. W ½ of District. Fairly common.
Antelope ground squirrel. Eastern Elko County. Below Transition life-zone.
Golden-mantled ground squirrel. Transition and higher life-zone. Open timber where rocks or fallen logs or both occur. Rock slide.
Least Chipmunk. Boreal. Sagebrush. Small. Climb in sagebrush.
Yellow-pine chipmunk. Conifer tree areas. Transition life-zone. Habitat - rocks, brush. Northcentral part of County only.
Cliff chipmunk. East edge of District. Pinon-juniper areas and higher.
Colorado chipmunk. Conifer. Above pinon-juniper. Meadow edges, logs, rocks. Ruby Mountains.
Northern pocket gopher. Common throughout the District at higher elevations.
Townsend pocket gopher. Areas mountain deep soils - Humboldt River Valley.
Little pocket mouse. Nocturnal. E part of District and Humboldt River Valley. Dry areas. Doesn't need water. Lower Sonoran and Upper Sonoran below pinon-juniper. Valley slopes.
Great Basin pocket mouse. Upper Sonoran. District-wide. 3900-10,000 ft. Metabolize water.
Dark kangaroo mouse. Nocturnal. Humboldt River Valley and South.
Ord kangaroo rat. District-wide. Upper Sonoran life-zone. 3900-9,000 ft. Nocturnal.
Great Basin kangaroo rat. Upper Sonoran. Sagebrush to shadscale greasewood belt. E ½ of District. Nocturnal.
Beaver. Northern half and western half of District of streams.
Western harvest mouse. District-wide. Upper Sonoran life-zone. Grassy places near water. Nocturnal.
Canyon mouse. Stony places among rocks. Openings of canyons from mountains.

mon Redpoll
k Rosy Finch
___ ne Siskin
___American Goldfinch
___Lesser Goldfinch
___Red Crossbill
___Green-tailed Towhee
___Rufous-sided Towhee
___Savannah Sparrow
___Grasshopper Sparrow
___Vesper Sparrow
___Sage Sparrow
___Slate-colored Junco
___Oregon Junco
___Gray-headed Junco
___Tree Sparrow
___Chipping Sparrow
___Brewer's Sparrow
___Harris' Sparrow
___White-crowned Sparrow
___Golden-crowned Sparrow
___White-throated Sparrow
___Fox Sparrow
___Lincoln's Sparrow
___Swamp Sparrow
___Song Sparrow



*AVOCET*

## NOTES

Date ________________ Total __________

Observer(s) ______________________________

Weather ________________ Time __________

*SANDHILL CRANE*

*COMMON NIGHTHAWK*

**"THIS LAND IS YOUR LAND"**

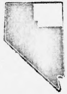
**and so is the Wildlife**

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management
Elko District Office
February 1971

*SONG SPARROW*

# BIRDS

## ELKO
## BLM DISTRICT



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Because of the mountain ranges and valley bottoms there is a wide variety of wildlife habitat and bird life.

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## BIRD C KLIST

## ELKO B TRICT

The following bird list contains 238 species, which have been recorded in this area. The column at the left is provided for checking species observed.

Birds printed in box are rare or endangered fauna of the United States. Birds marked with an asterisk are in an undetermined rare or endangered status. All the birds on this list are protected by Federal Law or Nevada State Law except for a few species including crows, magpies, ravens, starlings and English sparrows.

This list was compiled through cooperative assistance from the Lahontan Chapter of the Audubon Society, Nevada State Museum, Nevada Department of Fish and Game, U.S. Bureau of Sport Fisheries and Wildlife, and U.S. Forest Service.

### LOONS
___ Common Loon
___ Artic Loon

### GREBES
___ Horned Grebe
___ Eared Grebe
___ Western Grebe
___ Pied-billed Grebe

### CORMORANTS AND PELICANS
___ White Pelican
___ Double-crested Cormorant

### HERONS, BITTERNS, EGRETS, IBISES
___ Great Blue Heron
___ Common Egret
___ Snowy Egret
___ Black-crowned Night Heron
___ Least Bittern
___ American Bittern
___ White-faced Ibis

### SWANS, GEESE AND DUCKS
___ Whistling Swan
___ Trumpeter Swan
___ Canada Goose
___ White-fronted Goose
___ Snow Goose
___ Mallard
___ Gadwall
___ Pintail
___ Green-winged Teal
___ Blue-winged Teal
___ Cinnamon Teal
___ American Widgeon
___ Shoveler
___ Wood Duck
___ Redhead
___ Ring-necked Duck
___ Canvasback
___ Greater Scaup
___ Lesser Scaup
___ Common Goldeneye
___ Barrow's Goldeneye
___ Bufflehead
___ Ruddy Duck
___ Hooded Merganser
___ Common Merganser
___ Red-breasted Merganser

### VULTURES, HAWKS AND FALCONS
___ Turkey Vulture
___ Goshawk
___ Sharp-shinned Hawk
___ Cooper's Hawk
___ Red-tailed Hawk
___ Swainson's Hawk
___ Rough-legged Hawk
___* Ferruginous Hawk
___ Golden Eagle
___ Bald Eagle
___ Marsh Hawk
___* American Osprey

___ Prairie Falcon

___ Peregrine Falcon

___ Pigeon Hawk
___ Sparrow Hawk

### GROUSE, QUAIL, PHEASANT, PARTRIDGES
___ Blue Grouse
___ Ruffed Grouse
___ Sharp-tailed Grouse
___ Sage Grouse
___ Scaled Quail
___ California Quail
___ Mountain Quail
___ Ring-necked Pheasant
___ Chukar
___ Gray Partridge
___ Himalayan Snow Partridge

### CRANES

___ Greater Sandhill Crane

### RAILS AND COOTS
___ Virginia Rail
___ Sora
___ American Coot

### PLOVERS, SNIPE, SANDPIPERS
___ Killdeer
___ Common Snipe
___ Long-billed Curlew
___ Spotted Sandpiper
___ Solitary Sandpiper
___ Willet
___ Greater Yellowlegs
___ Lesser Yellowlegs
___ Baird's Sandpiper
___ Least Sandpiper
___ Long-billed Dowitcher
___ Western Sandpiper
___ Marbled Godwit

### AVOCETS, STILTS, PHALAROPES
___ American Avocet
___ Black-necked Stilt
___ Wilson's Phalarope
___ Northern Phalarope

### GULLS AND TERNS
___ California Gull
___ Ring-billed Gull
___ Franklin's Gull
___ Forster's Tern
___ Caspian Tern
___ Black Tern

### PIGEONS AND DOVES
Band-tailed Pigeon
Rock Dove or Domestic Pigeon
White-winged Dove
Mourning Dove

### WLS
___ Barn Owl
___ Screech Owl
___ Great Horned Owl
___ Burrowing Owl
___ Long-eared Owl
___ Short-eared Owl
___ Saw-whet Owl
___ Poor-will
___ Pygmy Owl

### GOATSUCKERS
___ Common Nighthawk

### SWIFTS
___ White-throated Swift

### HUMMINGBIRDS
___ Broad-tailed Hummingbird
___ Rufous Hummingbird
___ Calliope Hummingbird

### KINGFISHERS
___ Belted Kingfisher

### WOODPECKERS
___ Yellow-shafted Flicker
___ Red-shafted Flicker
___ Lewis' Woodpecker
___ Yellow-bellied Sapsucker
___ Hairy Woodpecker
___ Downy Woodpecker

### FLYCATCHERS
___ Eastern Kingbird
___ Western Kingbird
___ Ash-throated Flycatcher
___ Say's Phoebe
___ Traill's Flycatcher
___ Hammond's Flycatcher
___ Dusky Flycatcher
___ Gray Flycatcher
___ Western Flycatcher
___ Western Wood Pewee
___ Olive-sided Flycatcher

### LARKS
___ Horned Lark

### SWALLOWS
___ Violet-green Swallow
___ Tree Swallow
___ Bank Swallow
___ Rough-winged Swallow
___ Barn Swallow
___ Cliff Swallow

### JAYS, MAGPIES AND CROWS
___ Scrub Jay
___ Black-billed Magpie
___ Common Raven
___ Common Crow
___ Pinyon Jay
___ Clark's Nutcracker

### TITMICE, CHICKADEE, BUSHTITS
___ Black-capped Chickadee
___ Mountain Chickadee
___ Plain Titmouse
___ Common Bushtit

### NUTHATCHES
___ White-breasted Nuthatch
___ Red-breasted Nuthatch

### CREEPERS
___ Brown Creeper

### DIPPERS
___ Dipper

### WRENS
___ House Wren
___ Winter Wren
___ Long-billed Marsh Wren
Canyon Wren
Rock Wren

### MOCKINGBIRDS AND T HERS
Mockingbird
Catbird
Sage Thrasher

### THRUSHES, BLUEBIRDS, SOLITAIRES
___ Robin
___ Hermit Thrush
___ Swainson's Thrush
___ Veery
___ Western Bluebird
___ Mountain Bluebird
___ Townsend's Solitaire

### KINGLETS
___ Golden-crowned Kinglet
___ Ruby-crowned Kinglet

### PIPITS
___ Water Pipit

### WAXWINGS
___ Bohemian Waxwing
___ Cedar Waxwing

### SHRIKES
___ Northern Shrike
___ Loggerhead Shrike

### STARLINGS
___ Starling

### VIREOS
___ Solitary Vireo
___ Red-eyed Vireo
___ Warbling Vireo

### WARBLERS
___ Orange-crowned Warbler
___ Nashville Warbler
___ Virginia's Warbler
___ Yellow Warbler
___ Myrtle Warbler
___ Audubon's Warbler
___ Black-throated Gray Warbler
___ Townsend's Warbler
___ Hermit Warbler
___ Chestnut-sided Warbler
___ Blackpoll Warbler
___ Northern Waterthrush
___ MacGillivray's Warbler
___ Yellowthroat
___ Yellow-breasted Chat
___ Wilson's Warbler

### WEAVER FINCHES
___ House Sparrow

### MEADOWLARKS, BLACKBIRDS, ORIOLES
___ Bobolink
___ Western Meadowlark
___ Yellow-headed Blackbird
___ Red-winged Blackbird
___ Bullock's Oriole
___ Brewer's Blackbird
___ Brown-headed Cowbird

### TANAGERS
___ Western Tanager

### GROSBEAKS, SPARROWS, FINCHES, BUNTINGS
___ Rose-breasted Grosbeak
___ Black-headed Grosbeak
___ Indigo Bunting
___ Lazuli Bunting
___ Evening Grosbeak
___ Cassin's Finch
___ House Finch
___ Gray-crowned Rosy Finch

## SNAKES

**Boas: Family Boidae**

Rocky Mountain rubber boa *(Charina bottae utahensis).*

Frequents grassland, woodland, and forest in and beneath rotting logs. A rocky stream with banks of sand or loam in a coniferous forest is a favorable habitat. A good swimmer, burrower, and climber. Only known location in the District is around Jarbidge.

**Colubrids: Family Colubridae**

Northwestern ringneck snake *(Diadophis punctatus occidentalis).*

This snake frequents moist habitats such as woodlands, forests, grasslands, farms and gardens. Restricted to mountains and water courses in the West. It may descend in desert areas to 2,400 feet. Found in the extreme northeast of Nevada.

Western yellow-bellied racer *(Coluber constrictor mormon).*

This snake favors open habitats of meadows, thin brush, and forest glades. Lives in semi-arid and moist environments. Avoids extremely dry areas and high mountains. Found throughout entire western two-thirds of Elko District.

Desert striped whipsnake *(Masticophis taeniatus taeniatus).*

A snake of brushlands, grasslands, sagebrush flats, pinyon-juniper, and open pine-oak forests to 9,400 feet. An alert, fast-moving, diurnal snake found throughout most areas of the Elko District.

Great Basin gopher snake *(Pituophis melanolencus deserticola).*

Occupies a great variety of habitats; cultivated fields, grass or brush are especially favored. The most common snake in the Elko District; found throughout most of the District and the entire state of Nevada.

Western long-nosed snake *(Rinocheilus lecontei lecontei).*

This snake inhabits deserts, prairies, and brushlands, in valleys and foothills, but seldom occurs in the mountains. A good burrower, it spends its daylight hours underground. Found throughout most of the Elko District in above-described habitats.

Valley garter snake *(Thamnophis sirtalis fitchi).*

Found around prairie swales, marshes, ponds, roadside ditches, damp meadows, woods, farms, city lots and streams. Found throughout the entire District.

Wandering garter snake *(Thamnophis elegans vagrans).*

This snake has a variety of habitats - grassland, woodland, brushland, from sea level to high mountains (10,500 feet) often in damp environments near water. Found throughout most of the Elko District.

Western ground snake *(Sonora semiannulata).*

Frequents sandy hillsides or flats, with or without rocks. Found under rocks or in sand hummocks, to 6,000 feet. Located along the west edge of the Elko District.

Desert night snake *(Hypsiglena torquata deserticola).*

Habitat consists mainly of sagebrush flats, deserts, woodlands and lower slopes of mountains (to 7,000 feet) in both rocky and sandy areas. A nocturnal prowler feeding on lizards and frogs. Kills prey by injecting venom from rear enlarged grooved teeth of the upper jaw. Found throughout most of the Elko District in favorable habitats and on roads.

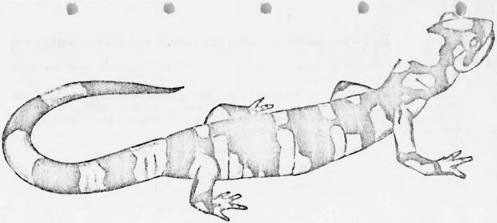
**Vipers: Family Viperidae**

Great Basin rattlesnake *(Crotalus viridis lutosus).*

Like the Prairie Rattlesnake, the Great Basin rattler frequents a variety of habitats - grassland, brushland, woodland, rock outcrops, talus, rocky stream courses and ledges to 11,000 feet, but avoids the barren and alkali deserts. Found in many locations throughout the entire Elko District.

**"Reptiles and Amphibians of the ELKO BLM District" Brochure**
**BLM Nevada State Office**
**300 Booth Street, Reno, Nevada 89502**

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
Elko, Nevada
September 1972



# REPTILES AND AMPHIBIANS

# OF THE ELKO BLM DISTRICT

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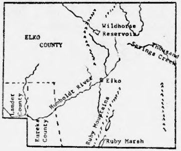
# ANNOTA LIST OF THE AMPHIBIANS AND REPTILES OF THE ELKO BLM DISTRICT

The following reptile and amphibien list contains 32 species and subspecies, which have been recorded in this District.

This list was compiled from Jean M. Linsdale's, *Amphibians and Reptiles in Nevada*, 1938, and Robert C. Stebbins', *A Field Guide to Western Reptiles and Amphibians*, 1966, with cooperation from David L. Doty, Professional Herpetologist, Reno, Nevada, and Eric R. Skov, Nevada Department of Fish and Game, Wells, Nevada.



## AMPHIBIANS

**Salamanders: Family Ambystomidae**

Utah tiger salemender *(Ambystoma tigrinum utahensis)*.

Frequents water of ponds, reservoirs, lakes, temporary rain pools, and streams from arid sagebrush plains and rolling grassland to mountain meadows and forests. Found in the northeast corner of the Elko District.

Blotched tiger salamander *(Ambystoma tigrinum melanostictum)*.

Frequents quiet water of ponds, reservoirs, lakes, temporary rain pools, and streams from arid sagebrush plains end rolling grassland to mountain meadows and forests. Found in the northeast corner of the Elko District.

**Spadefoot Toads: Family Pelobatidae**

Western spadefoot *(Scaphiopus hammondi)*.

Found mainly in alkaline areas in large valleys. Known finds are in the northwestern part of Elko District.

Great Basin spadefoot *(Scaphiopus intermontanus)*.

Ranges from sagebrush flats, juniper-pinyon zones to higher elevations of the spruce-fir belt. Distribution throughout entire District. In dry weather, burrows into ground or uses burrows of other animals.

**True Toads: Family Bufonidae**

Boreal toad *(Bufo boreas boreas)*.

Frequents a great variety of habitats, desert streams, springs, grasslands, woodlands, end mountain meadows. Found in and near ponds, lakes, reservoirs, rivers end streams. Buries itself in loose soil or hides in burrows of other animals. Distributed extensively throughout entire District.

Rocky Mountain toad *(Buffo woodhousei woodhousei)*.

Occurs in a variety of habitats - grassland, sagebrush flats, woods, desert streams, valleys and flood plains. Appears to prefer sandy areas, breeding in quiet waters of streams, marshes, lakes, irrigation ditches and fresh water pools, usually during or soon after rains. Lower eastern area along Nevada-Utah border are areas of finds.

**Tree Frogs: Family Hylidae**

Western chorus frog *(Pseudacris triseriata triseriata)*.

Found around or near grassy pools, lakes and marshes of prairies and mountains. Has been found in the extreme northeast corner of the Elko District.

Pacific treefrog *(Hyla regilla)*.

A small frog frequenting e variety of habitats from sea level to high in the mountains. Chiefly a ground dweller found among low plant growth near water. Extensive locations throughout western two-thirds of Elko District.

**True Frogs: Family Randiae**

Spotted frog *(Rana pretiosa)*.

Occurs in springs, marshes, streams, and ponds to altitudes of 5,000 to 6,000 feet. These frogs are very shy and disappear quickly when disturbed. Found in the southwestern Elko District.

Leopard frog *(Rana pipiens)*.

This widely distributed frog of the Elko District frequents springs, creeks, rivers, ponds, canals, and reservoirs where there is permanent water and growths of cattails or other aquatic vegetation. Mainly at altitudes between 4,000 and 6,000 feet. Most easily found at night by its eyeshine. This highly adaptable species is found throughout the entire state of Nevada.

Bullfrog *(Rana catesbeiana)*.

Highly aquatic, remaining in or near permanent waters, its activities usually independent of rainfall. Frequents marshes, lakes, ponds, streams end reservoirs. Mostly around quiet waters where there are thick growths of cattails end/or other aquatic vegetation. Has been found on the west edge of the Elko District and around Wells.

## REPTILES

**Lizards: Family Iguanidae**

Collared lizard *(Crotophytus collaris)*.

A rock dwelling lizard that frequents canyons, rocky gullies, mountain slopes and boulder strewn hillsides. Found only in southwestern part of District.

Long-nosed leopard lizard *(Crotaphytus wislizenii wislizenii)*.

Found in arid and semi-arid plains grown to bunchgrass, shadscale, sagebrush, creosote bush and other low plants. Ground may be hardpan, gravel, or sand; rocks may or may not be present. Found only in southwestern Elko District.

Great Basin fence lizard *(Sceloporus occidentalis biserlatus)*

One of the most common western lizards often seen in wooded and rocky places, around old buildings, woodpiles, fences and banks with rodent burrows. Found throughout the Elko District in abundance.

Northern sagebrush lizard *(Sceloporus graciosus graciosus)*.

A ground dweller, usually found near bushes, logs, rocks or brush heaps. Occurs at high altitudes, probebly even higher than the Western Fence Lizard. Occurs throughout the entire Elko District.

Northern side-blotched lizard *(Uta stansburiana stansburiana)*.

A desert species with a habitet of loose sand and scattered bushes and trees, creosote bush, burrow bush, galleta grass, catclaw, mesquite, and paloverde. Diurnal and very heat tolerant. Found throughout the Elko District.

Northern desert horned lizard *(Phrynosoma platyrhinos platyrhinos)*.

Most widespread horned lizard in the District. Frequents shadscale, greasewood, sage and cactus, in the desert mostly in sandy areas. Found in good habitats throughout entire Elko District.

Pigmy horned lizard *(Phrynosoma douglassi douglassi)*.

Located throughout the Elko District. Found in the open during warmer parts of the day. Adults keep close to shelter of bushes where their broken coloration is protective. Young stay in more open areas, because of their even coloration.

Salt Lake horned lizard *(Phrynosoma douglassi ornatum)*.

Moves freely through semi-arid plains and into the high mountains (10,000 feet) in e variety of habitats from sagebrush, to shortgrass, pinyon-juniper, pine-spruce, and spruce-fir. This lizard is found in the central area of the Elko District. It is more cold tolerant than other horned lizards.

**Skinks: Family Scincidae**

Great Basin skink *(Eumeces skiltonianus utahensis)*.

Found in grassland, woodland, and forests, under logs, bark, rocks end other surface objects near streams and sometimes on dry hillsides far from water. Located in suitable habitats throughout entire Elko District.

**Whiptails: Family Teidae**

Great Basin whiptail *(Cnemidophorus tigris tigris)*.

An active lizard of arid and semi-arid habitats occurring along grevelly washes, and in rocky places in sagebrush, grasslend, end brushy foothill areas. Found in suitable habitats throughout entire Elko District.

## C. Ecological Interrelationships

### 1. Ecological Processes

The environment of the subject area is broad and active during all seasons of the year. The nutrient cycle of soil to plants to animals to waste to soil with energy exchange and loss at each junction is the basic process in operation and is affected by the proposed actions. Likewise, is the aquatic nutrient cycle of soil to organisms to water to plants to insects to animals to waste to soil.

Illustration XV shows the environmental interrelationships for aquatic environments.

#### a. Succession

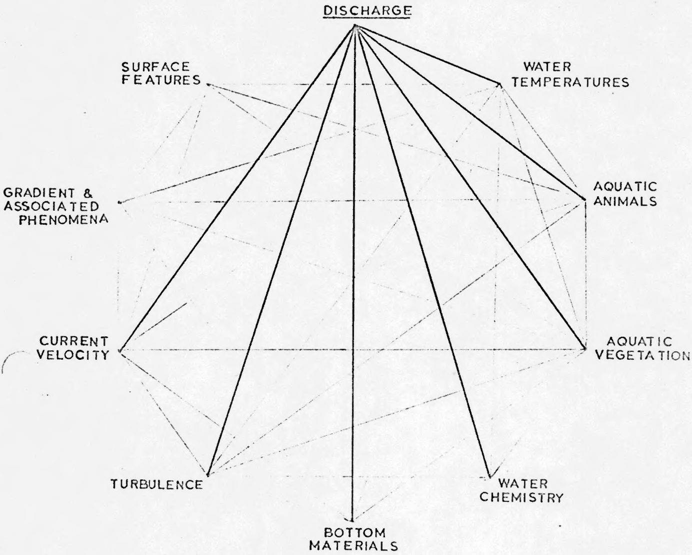
The analysis to follow may primarily consider the cold desert biome; however, most principles apply to the other ecosystems of the subject area. Therefore, an analysis for each vegetative zone is not necessary.

Desert ecosystems are in a constant delicate balance and any of man's influences in the area can have detrimental results. The plants in the valley and foothill ecosystems, as common with all desert vegetation, are widely-spaced with large areas of bare ground between plants. Removal of the vegetation by man, fire, drought or grazing animals leaves the soil vulnerable to all forms of erosion over extended periods of time. Low rainfall and unfavorable growing conditions are not favorable for rapid replacement of the protective vegetative cover.

The streams, ponds and marshes are essential to many of the migratory birds of the Pacific Flyway. This is the main relationship to the birds using the waters as a rest stop along with serving as a waterfowl and fish producer - see the Birds, Fish and Amphibians Sections of Existing Environment. The ponds are essential to the fishery in those ponds for food, shelter and other necessities of life.

Geothermal development may affect aquatic and riparian habitat areas. Life existing around the thermal springs and related water sources are there primarily because of dependence on that environmental aspect or the natural adaptation to the aquatic, thermal water or mesic environments. Any factor changing water temperature in the existing environment would have severe impact upon the bio-mass of that area. Likewise, any change in water level could have real impacts.

# AQUATIC AND STREAM ENVIRONMENT



Major interactions between stream discharge and the aquatic environment. Arrows have not been added since many of the relationships are two-way.

Streamflow Requirements of Salmonids,
Anadromous Fish Project Report,
Oregon Wildlife Commission, R. Giger, 1973.

Surface water is an important and often limiting factor in the distribution and survival of animal populations. Further, this is also a factor in human uses of the lands.

b. Food Relationships

Illustration XVI depicts typical terrestrial environment food relationships.

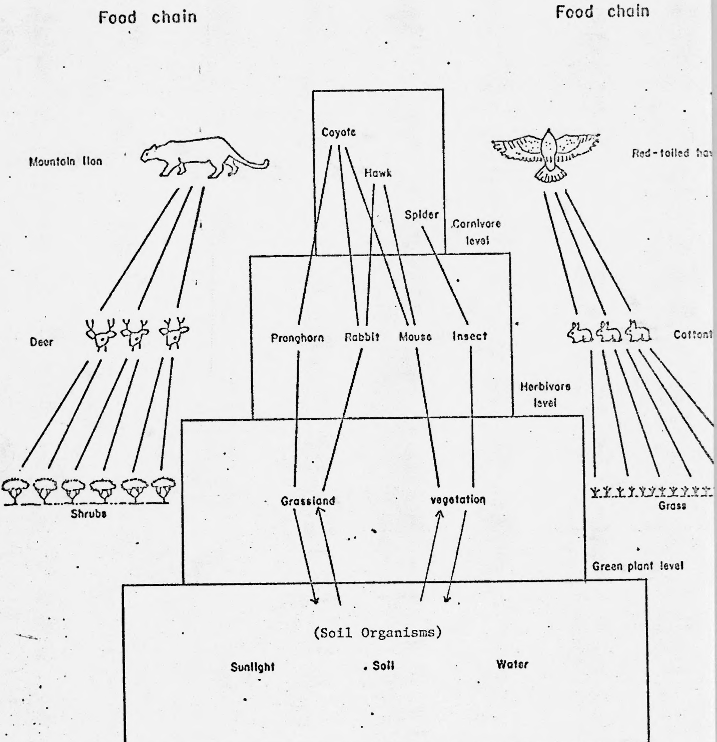
At the present time, the area is not producing vegetation at its maximum potential. It has become an unbalanced ecosystem which is a less than desirable desert habitat. Many of the native vegetative plant associations are composed of one or two dominant vegetative species. Examples are the big sagebrush and pinyon-juniper vegetative types. Many of these areas do not support sufficient amounts of associated brush, grass and forb species to make them desirable ecotypes.

The vegetation is a limiting factor for the continuance of the food chain and energy transfer. To a lesser degree, the hydrologic cycle is affected because a less useful vegetation is present which allows increased runoff and evaporation of water.

Livestock management practices is one of the main reasons for the deteriorated condition of the vegetative associations. Livestock grazing use is allowed continuously during critical plant growth stages. Spring use by cattle and sheep is being practiced over large portions of the subject lands. Grazing of new green vegetative material during the early spring removes a large portion of the plant's food reserves. Plant food reserves are manufactured and stored during the summer months, to maintain life during the winter and initiate growth the following spring. When repeated grazing during the spring growing season is practiced on the same area for an extended period of time, the grass and forb species have their food reserves depleted to the point that they are no longer able to maintain life. As a result, certain species completely disappear or are reduced in numbers to the extent that other less desirable species replace them.

All plant-eating animals require a variety of plant species to satisfy their needs for food. Mule deer require a variety of browse plants and herbaceous plants to satisfy winter forage requirements. During the spring, the herbaceous

## ILLUSTRATION XVI
## Typical Terrestrial Environment



Biotic pyramid showing portion of a grassland food web

(Environmental Conservati
Dasmann 1959)

plants become more utilized. There are few forage species that can serve as single-item diets and sustain deer for several weeks. Mule deer, as many other animal species, need mixtures of several forages to maintain good condition, maximum survival and gain.

Specific habitat requirements for wild horses cannot be identified at this time. However, observations of wild horses inhabiting the Duckwater Planning Unit in the Ely District, indicate that limited habitat components are detrimental. Wild horses in the Duckwater Unit tend to concentrate which tends to break down the expression of territorialism. Although the specific causes of this occurrence cannot be positively identified, isolation and forage conditions are believed to be the main causes. The concentration areas are generally well-isolated from the activities of man and contain a relatively abundant supply of food which is in contrast to adjacent areas which are either located closer to human activity or contain large concentrations of non-forage producing pinyon-juniper trees. Horses of the other ranges in the subject area are not so concentrated to small, marginal ranges.

A crucial area is an area where a wildlife species depends upon certain habitat conditions to carry out life functions during any critical season of the year. These requirements may be migration routes and winter range areas for deer; winter range and nesting areas for the eagle; nesting sites for the endangered prairie falcon; sage grouse strutting grounds and brood-rearing areas; and antelope kidding grounds.

Because horses in a wild state are believed to be territorial, the concept of crucial areas could be extremely important to wild horses. For example, if a band of horses establishes a territory centered around a crucial area, their entire existence in a wild state will be dependent on maintenance of the crucial area. If the crucial area is lost, horses will be forced to abandon their established territory and invade the territories of other bands. This could result in a breakdown of territorialism for the herd.

The particular time during which a species is in danger of local destruction is considered a critical period. A critical period is produced any time a limiting factor is created. During such a time, there may be heavy mortality of the individuals, and the species may even become locally destroyed.

### c. Hydrological Cycle

The importance of surface water in the area is high due to the small perennial streams and the lakes. Surface water increases during spring and summer runoff and after summer thunder showers.

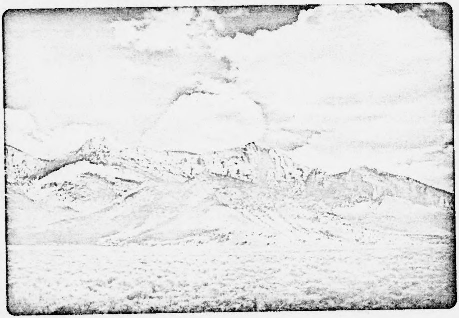
The source of practically all groundwater in the area is derived from precipitation. Maximum thickness of the groundwater reservoir is not known, but the subsurface movement is in the direction of surface flow, from the mountains towards the valley floors. Annual discharge is from evapotranspiration, domestic use from wells, springs, creeks, subsurface outflow and evaporation.

Much of the water from spring and summer runoff is used for domestic or livestock purposes and agricultural irrigation. Groundwater feeds springs on both public and private lands. The ponds and marshes require significant quantities of subsurface or groundwater to maintain their level from losses to drainage evapotranspiration and evaporation.

## D. Human Interest Values

### 1. Landscape Character

The subject lands have all characteristics which stimulate man's five senses; however, individuals react differently to the stimuli of the natural environment. The character of a landscape is defined as the overall impression created by its unique combination of visual features as seen in terms of color, form, line, scale and texture. These are primarily visual evaluation factors with little or no regard for other senses.



The photo depicts the scenic value associated with rough, primitive mountainous areas. The snow-covered Goshute Mountains area displays many qualities looked for in mountainous scenery.

#### a. Smell, Sound, Taste and Touch Aesthetics

The subject area has the variety of natural smell, sound, taste and touch one would expect for a given area. Realizing that some areas are occupied by man's influence, it is of no great consequence to discover foreign sense stimuli when around ranches, mines, campgrounds, highways or cities. If one prefers the solitude of nature, there are many areas which are more-or-less natural where one may preceive natural environment. One of the most significant attributes of the subject area is open space for man's enjoyment of nature.

### b. Visual Aesthetics

The subject area offers a wide variety of scenic opportunity from almost dismal valley playas through rugged, towering, majestic mountains. Man's influence has compromised the natural setting in many areas. However, some enhancement has resulted within areas of ranch haylands, golf courses and cities.

The desert, sagebrush and pinyon-juniper vegetative zones afford visual aspect common throughout so much of the western United States. The monotony of the scenery is only broken by vegetative lines or color changes. Occasional aquatic areas or streams are found to add a welcomed contrast to otherwise endlessness. During height of winter, these vegetational zones occasionally have striking scenic quality as snow clings like fluffy cotton candy from the many vegetative branches with smoke-blue mountains as the background. Spring moisture transforms these otherwise drab areas into a variety of color as shrubs and grasses green-up and colorful forbs respond to the new season.

The vegetative zones associated with the mountain areas are more intriguing, offering a wide range of color, form and scale contrast. One can find solitude, serenity and enjoyment while visiting these wild areas.

The photo depicts scenic quality found in several of the BLM and most USFS scenic areas - BLM photo.

Scenic quality varies from simple color contrast of vegetative variety, soils and rocks to rugged sheer cliffs, talus slopes and boulder fields with interspersed vegetation.

The photo of mountainous terrain depicts the variations of color, form, line, scale and texture which combine to form harmonious scenic qualities. (BLM Photo - Site Unknown).

Mountain areas offer another outstanding feature to the ambitious individual who doesn't mind hiking to the summit of a towering mountain. The reward is a panoramic view of lower mountains and large valleys. The National Forest areas contain the more scenic areas of the vicinity. Only a few areas of public lands may be considered for high scenic values.

The areas of particular scenic and recreational appeal are shown in Illustration XVII, and listed as follows:

> NOTE: The letter and number are keyed to Map Illustration XVII.

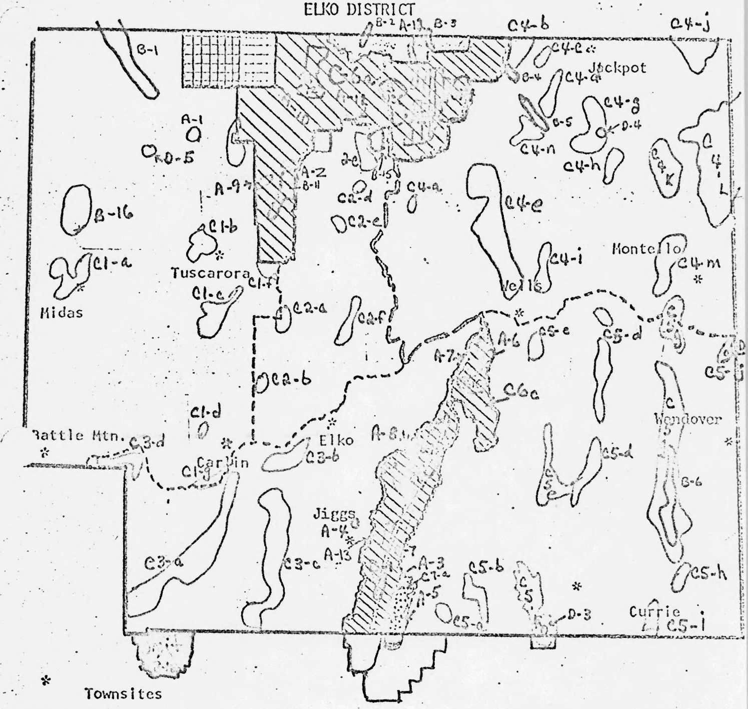
A. Intensive Recreational Use Areas

- Developed and Undeveloped Campgrounds and Other Known High Use Areas

ILLUSTRATION XVII
Recreation, Science, Primitive and Wilderness Areas.

## BUREAU OF LAND MANAGEMENT

## ELKO DISTRICT



* Townsites

▦ Indian Reservation

▨ National Forest

▒ Ruby Marsh Wildlife Refuge

▬ ▬ Resource Area Boundary

- - - Planning Unit Boundary

LEGEND

A Intensive Recreational Use Areas.

B Areas with Primitive Values non designated to date.

C Scenic Areas

D Ecological & Scientific interest areas

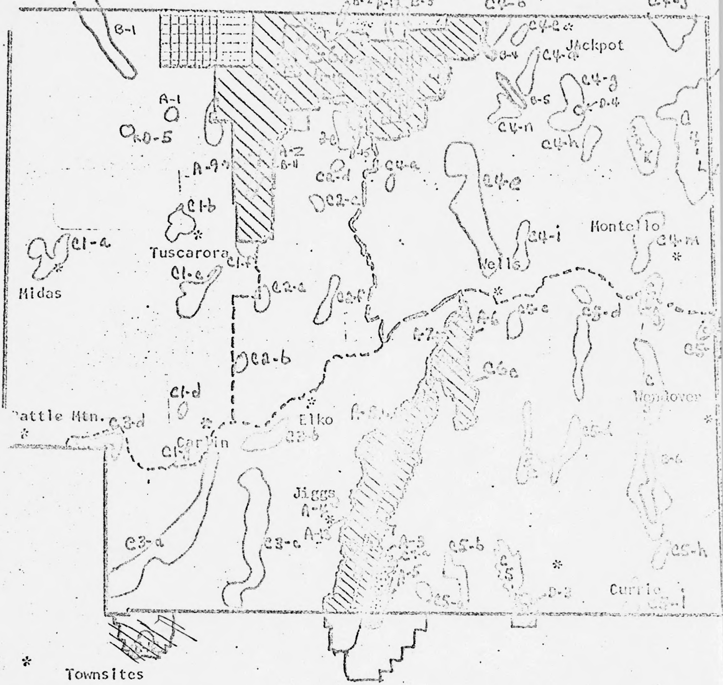
E Wilderness area

▥

ILLUSTRATION XVII
Recreation, Science, Primitive
and Wilderness Areas.

# BUREAU OF LAND MANAGEMENT

## ELKO DISTRICT



* Townsites

▦ Indian Reservation

▨ National Forest

⁘ Ruby Marsh Wildlife Refuge

— — Resource Area Boundary

- - - Planning Unit Boundary

LEGEND

| | |
|---|---|
| A | Intensive Recreational Use Areas. |
| B | Areas with Primitive Values non designated to date. |
| C | Scenic Areas |
| D | Ecological & Scientific interest areas |
| E<br>▥ | Wilderness area |

1. Wilson Sink Recreation Site and 1 mile buffer around the reservoir.

2. North Fork Campground and fishing area.

3. Ruby Marsh Campground and buffer strip along the refuge west boundary.

4. Zunino Reservoir and future camp site and one mile buffer area.

5. Ruby Marsh South Sump and fishing area.

6. Angel Lake upper and lower campgrounds and protective areas.

7. Tent Mountain proposed winter sports area.

8. Lamoille Canyon Campgrounds and fishing area.

9. Jack Creek Campground and fishing area.

10. Wildhorse Campground, buffer of one mile around the reservoir, Wildhorse Crossing Campground and the Owyhee Canyon.

11. Gold Creek Campground and protective area.

12. Jarbidge Campgrounds and river fishing area.

13. Green Mountain potential winter sports area.

B. Primitive Areas

These are roadless areas within very rough, steep and towering mountainous areas. USFS sites are presently under study for possible wilderness withdrawal. BLM sites are primarily river canyons where sheer rough canyons have been carved through the lava plateaus.

1. South Fork Owyhee River. Approximately two miles from the canyon on each side - BLM.

2. The Bruneau River Canyon gorge is currently being considered for wild and scenic river designation - two-mile protective buffer on each side - BLM.

3. East Fork of Jarbidge River - Same as No. 2 - BLM.
4. Wilson Creek gorge on Salmon Falls Creek and buffer area - BLM.
5. Salmon Falls River badlands area - BLM.
6. The Goshute Mountains wild roadless area - BLM.
7. Ruby Mountains wild roadless area being studied for wilderness values - USFS.
8. Same as No. 7 - South Fork Portion - USFS.
9. Same as No. 7 - Northern Portion - USFS.
10. Same as No. 7 - East Humboldt Range Portion - USFS.
11. Independence Mountains wild, rough and roadless area - USFS.
12. The Mahoganies wild, rough and roadless area - USFS.
13. Copper Mountains wild, rough and roadless area - USFS.
14. The Jarbidge roadless area being evaluated for wilderness consideration - USFS.
15. Rough Hills - BLM roadless area being considered for primitive values.
16. The South Fork of the Little Humboldt River - BLM.

## C. Scenic Areas

These have been identified for the significant and unique qualities of scenic interest.

1. Tuscarora Planning Unit
    - a. Midas
    - b. Mt. Blitzen area
    - c. Beaver Creek area
    - d. Mary's Mountain
    - e. Bull Run Mountains
    - f. Wheeler Mountain
    - g. Palisade Canyon

2. North Fork Planning Unit
    a. Lone Mountain
    b. Swales Mountain
    c. Haystack Mountain area
    d. Wildhorse Mountain
    e. Double Mountain
    f. Adobe Range

3. Buckhorn Planning Unit
    a. Cortez Mountains
    b. Buckskin Mountain-Grindstone Mountain area
    c. Spring Range-Pinyon Range area
    d. Argenta Rim

4. Contact Planning Unit
    a. Stag Mountain
    b. Bear Creek Bench
    c. Bear Mountain
    d. Ela Dee Mountain and Mahogany Basin
    e. Snake Mountain Range
    f. Brown's Bench
    g. Granite Range
    h. Knoll Mountain
    i. Wells Peak-Black Mountain
    j. Goose Creek Mountains
    k. Delano Mountain
    l. Bald Mountain-Grouse Creek Mountains
    m. Toano Range
    n. Bad Lands-Salmon Falls-Cold Springs Mtn.

5. Currie Planning Unit
    a. Maveric Springs Range
    b. Medicine Range
    c. Wood Hills
    d. Pequop Mountains
    e. Spruce Mountain
    f. Cherry Creek Mountains
    g. Goshute Mountains
    h. Sugar Peak
    i. Kingsley Mountains
    j. Pilot Peak

6. National Forest Lands
    a. Independence, Mahoganies, Copper and Jarbidge Mountains
    b. Lamoille-Ruby scenic area
    c. Ruby and East Humboldt Mountains

7. Ruby Lake National Wildlife Area
    a. Marshland areas

D. Ecological and Scientific Interest Areas

1. Pearl Peak Bristlecone Pine Area-Ruby Mountains - USFS.
2. Pilot Peak Engelmann Spruce Area - BLM.
3. Taylor-High Peak Engelmann Spruce Area-Cherry Creek Range - BLM.
4. Chino and Winters Creeks-Red-banded Trout Habitat Area - BLM.
5. Ruby Mountains-Alpine communities.
6. Fraizer Creek-Type location, Humboldt Cutthroat Trout.

E. Wilderness Areas

1. Jarbidge Wilderness Area - USFS.

2. Social-Cultural Interest

a. Education/Scientific

(1) Geologic Features

The Elko District lies almost entirely within the Basin and Range physiographic province. Because of its geologic complexity, abundant mineralization, remoteness and stark beauty, this province has been a source of fascination and mystery to scientists since the early 1800's. Captain John C. Fremont led the first official exploring expedition to the Great Basin during the period 1843-45. As a part of this exploration, the boundaries of the Great Basin were mapped, and the course of the Humboldt River (main waterway of the Elko District), was recorded. Lieutenant E.G. Beckwith, U.S. Army, traversed the southern portion of the District during the summer of 1864, as part of the transcontinental railroad-route survey. The first comprehensive geologic study that included large portions of the Elko District was the "Fortieth Parallel Survey" led by Clarence King (also known as the "King Survey"). This ultimate goal was to "explore, map, and describe the geology, mineralization, flora, and fauna of the strip of land approximately 100 miles wide straddling the Fortieth Parallel of latitude (Patterson and others, 1969, p. 88)". During the period from 1871 to 1879, the Wheeler Survey partially overlapped King's Fortieth Parallel Survey in portions of what is now the Elko District. This survey, led by Lieutenant George M. Wheeler, U.S. Army, was assigned to explore "those portions of United States territory lying south of the Central Pacific Railroad, embracing parts

of eastern Nevada and Arizona (Patterson and others, 1969, p. 89)". This study was more comprehensive in scope than the King Survey; Wheeler also was charged with determining the "numbers, habits, and disposition of the Indian inhabitants, feasibility of road or railroad routes, mineral resources, and vegetation (Patterson and others, 1969, p. 89)".

The scientific surveys concentrated on mapping and inventory of the relatively unknown Great Basin territory to establish a transcontinental railroad route, and to encourage westward expansion. Their dissertations on mineral types and occurrences aided an already developing mining industry that was born out of the discovery of gold in the high Sierras during the 1850's.

Nevada's mineral deposits have been divided into two categories: (1) a precious metal (gold, silver, antimony, mercury) province, and (2) a base metal (lead, zinc, copper) province. The dividing line between both provinces trends northeast-southwest, and traverses the western margin of the Elko District; it passes through the towns of Battle Mountain and Mountain City, and eventually swings eastward into Idaho. Such famous mining districts as Tuscarora (gold, silver), Cortez (gold, silver), Carlin (gold), Battle Mountain (copper), Mountain City (copper, silver), Contact (lead, silver, copper), Dolly Varden (lead, silver, copper), and Spruce Mountain (lead, silver, copper), fall within these two provinces.

Besides mineral wealth, the Elko District has considerable energy potential in the form of oil, gas (see Technical Report), and geothermal resources.

Thermal areas such as hot springs and geysers have long been of both academic and aesthetic interest to scientists and laymen alike. Yellowstone, the nation's first national park, is filled to capacity each summer by tourists wishing to see majestic Old Faithful Geyser, or to be awed by the many and varied mineral pools, mud pots and hot springs throughout the park.

The current energy crisis has punctuated this interest in the form of extensive geothermal exploration.

Areas of related geologic interest in the Elko District are the Geysers at Beowawe and the Elko Hot Hole.

Thermal activity at Beowawe was first described in 1869 by A.S. Evans, a correspondent for the Overland Monthly during the construction of the Central Pacific Railroad. He described the Geysers area as follows:

> "...the Whirlwind Valley stretched away before us to the southward, skirted by bare, red hills on either side for miles. Across the valley, some six miles to the southeastward, half-way up the western slope of a hill, perhaps six hundred feet in height, we saw a long table-land or mesa, white upon the top, and with long ribbon-like streaks of blue and white running down from thence to the plain below. This had been designated as the locality of the Volcano Springs..." (Evans, 1869, p. 112.)

Evans (1869, p. 114), in his discussion of the active sinter terrace, described it as follows:

> "There appeared to be at least one hundred of the larger springs which were more or less active daily, and hundreds of smaller openings in the hill-side from whence steam and nauseating gases escaped."

The earliest geologic study of the region was made by Hague and Emmons in 1868 during the U.S. Geological Exploration of the 40th Parallel (King's 40th Parallel Survey). Their maps show the rocks in the geysers area to be predominantly basalt.

The most comprehensive published geologic study to date is by Nolan and Anderson (1934, p. 215-229). At the time of their study, three natural geysers were active. During the eruptive stage, two geysers played to a height of three feet and the third reached a height of twelve feet. The duration of eruption lasted approximately one minute for each geyser, with an intervening "quiet" period that lasted from 15 to 30 minutes. It was estimated that over one hundred active fumaroles [1/] were present. Seven hot springs are shown on the 1934 map (Nolan and Anderson, 1934, p. 219). During an 18 October 74 field check, only 5 hot springs were observed, and those were at the foot of the terrace. According

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[1/] Fumarole - A vent, usually volcanic, from which gases and vapors are emitted; it is characteristic of a late stage of volcanic activity.

to this same map, three mud pots were also present (see Technical Report for a detailed discussion of the area).

The geyser terrace and vicinity were intensively drilled (12 exploratory wells) during the period from 1959 to 1964. This has apparently caused the cessation of natural geyser activity (as of the 18 October 74 field check, no activity resembling the three described geysers was observed).

At present, the most spectacular features of the geyser terrace are the two "blowing" wells that spout to a height of approximately one hundred feet. It appears that these two wells occupy the former sites of two of the three described geysers.

Although access to the Beowawe geyser area is unrestricted, a word of caution to the casual observer is in order: the hot springs at the foot of the geyser terrace are approximately 100 yards north of the access road and all have recorded temperatures of 200 degrees - 203 degrees F. (which approaches the boiling point for this altitude). An unsupervised child or preoccupied adult could suffer serious or even fatal burns if he should stumble into these relatively deep pools. In addition to fumaroles (with vent temperatures of approximately 203 degrees F.), the geyser terrace has additional hazards. Because of the intricate "plumbing system" characteristic of geyser and hot spring areas, it is not inconceivable that an inexperienced (or even experienced!) observer could break through the siliceous crust into some of this "plumbing".

Elko Hot Springs (or Elko Hot Hole) was a landmark on the old emigrant trail prior to 1869. Some time during 1869, the Hot Hole was developed into Laumeister and Groepper's Humboldt Hot Springs spa (also known as White Sulphur Hot Springs). According to Patterson and others (1969, p. 547, 548), the hotel and bath-house had several owners and two major fires prior to 1900:

> "The first fire occurred the night of June 6, 1882, and burned the resort, constructed of wood, to the ground. The second fire occurred at 1:00 A.M. on the morning of June 23, 1899. Destruction at the spa was again complete; the resort guests barely managed to escape, and Mrs. J.J. Garrecht, the proprietress, was burned around the face and hands. Mrs. Garrecht rebuilt

> with brick after the fire. This building and the hot springs area are now incorporated in Elko County's home for the aged."

The Hot Hole is located just off the north side of Bullion Road approximately one mile southwest of the city center. Two connected pools are situated in the center of a porous carbonate mound that has been deposited by the hot water. The mound covers approximately one acre, and its northern margin reaches the Humboldt drainage. This type of deposit is called calcareous tufa and because of its porosity, most of the hot springs runoff has taken an underground route (through the porus tufa) to the Humboldt River. This runoff is concentrated into about four springs along a 100 yard section of the river bank. The temperature of these hot springs is great enough to form steam even on the warmest of days.

(2) Ecological Features

Natural phenomena associated with hot springs can also be of scientific interest. Unusual micro-organisms specially adapted to the environmental conditions around hot springs have been used in scientific research. In certain areas, mineral compounds have been deposited on and around roots of plants. Long after the plant has died, the calcified matrix remains. Mounds of these "skeletons" closely resembling piles of bones can be found near hot spots.

Terraces produced from suspended solutes in the thermal waters of Hot Springs Pt. Also shown is the aquatic vegetation establishment within the area. (BLM Photo - Hot Springs Point Competitive KGRA.)

Within the subject area, are small, isolated vegetative types having unknown significant scientific value. These are the Pearl Peak bristlecone community located in the Ruby Mountains and the Engelmann spruce communities located in the Cherry Creek Mountains and on Pilot Peak. Refer to Illustration XVII in the foregoing section. The Jarbidge Wilderness Area has been withdrawn under the 1964 Wilderness Act for the protection and maintenance of a wild and scenic natural environment.

There are eight species of rare, threatened or endangered wildlife species in the subject area. These are as follows:

| Species | Class |
|---|---|
| 1. American Peregrine Falcon<br>(Falco peregrinus anatum) | Endangered |
| 2. Prairie Falcon<br>(Falco mexicanus) | Threatened |
| 3. Southern Bald Eagle<br>(Haliaeetus leucccephalis) | Endangered |
| 4. Lahontan Cutthroat Trout<br>(Salmo clarki henshawi) | Endangered |
| 5. Humboldt cutthroat trout<br>(Salmo clarki subsps.) | Threatened |
| 6. Red-banded Trout<br>(Salmo sps.) | *Rare |
| 7. Artic Grayling<br>(Thymallus signifer) | Endangered |
| 8. Spotted Bat<br>(Euderma maculatum) | Threatened |

*This specie is unique in water temperature adaptation (in excess of 80 degrees F.), and is known to three small waters in Nevada, all within the subject area, and in waters of southeastern Oregon. See Illustration XVII for locations. (Page 50(a)).

The Ruby Lake National Wildlife Refuge is a significant environment for waterfowl and aquatic ecology. It is particularly important for canvasback duck nesting and rearing.

### (3) Historical

The subject area has had an active and interesting past. Early trappers, who explored the headwaters of the Snake River and Humboldt River drainages, were the first white men to venture into the area and find abundant fur-bearing animals.

The Central Pacific Railroad construction, which was a most significant impact to the settlement of the west, led to the settlement of the subject area. Shortly after its completion, mining activity accelerated as bonanza strikes of high-grade silver and gold were discovered in the northern mining districts. To feed the population, ranches sprang-up throughout the subject area during the 1870s and 1880s. When the mining boom slowed, the established ranching industry became the economic backbone of the subject area.

There are several old mining camps, ranches, trails and towns within the subject area. Most exist on private lands or patented mining claims and, by such locations, afford little opportunity for protective management. Sites found on public lands should be evaluated for significant historical value and protected. Illustration XVIII and listing displays major historical locations, trails and mining sites and represents a partial inventory of the whole area.

The photograph shows the ruts of the California Emigrant Trail adjacent to Thousand Springs Creek on public land in northeast Elko County - BLM photo.

A. Sites of Historic Value

1. Tuscarora Planning Unit
    - a. Edgemont Townsite
    - b. Cornucopia Townsite and Mining Area
    - c. Tuscarora Mining District
    - d. Ivanhoe Mine
    - e. Bootstrap Mine
    - f. Rip Van Winkle Mine
    - g. Humboldt River Trail
    - h. Gravelly Ford
    - i. Maggie Creek Trail - Ogden 1829
    - j. Tuscarora Townsite
    - k. Little Humboldt Trail - Ogden 1829

2. North Fork Planning Unit
    - a. Gold Creek Townsite
    - b. Charleston Townsite
    - c. North Fork Townsite
    - d. Coal Mine Canyon
    - e. Lone Mountain
    - f. Dinner Station
    - g. Tuscarora Wagon Road
    - h. Tonka Townsite
    - i. Moleen Townsite
    - j. Elko
    - k. California Emigrant Trail
    - l. Osino Townsite
    - m. Ryndon Townsite
    - n. Elberz Townsite
    - o. Halleck Townsite

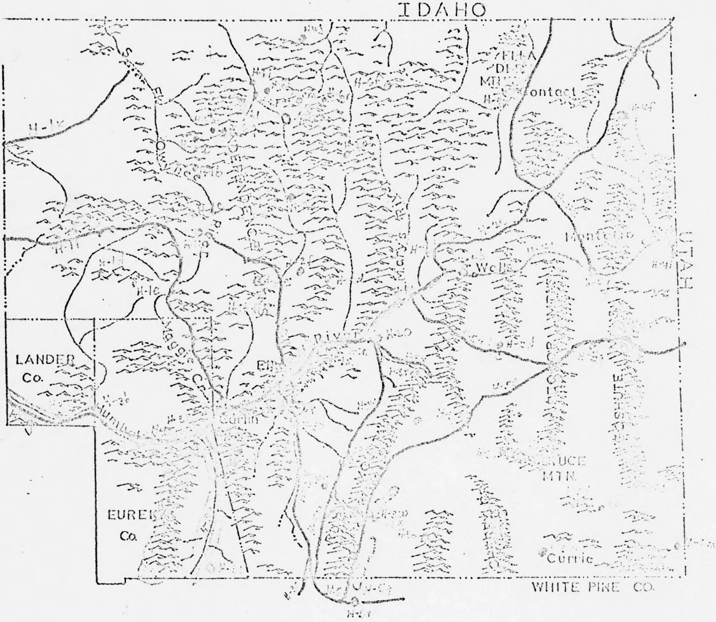
3. Buckhorn Planning Unit
    - a. Argenta R.R. Siding and Town
    - b. Dunphy Townsite
    - c. Old C.P. Grade
    - d. Beowawe Townsite
    - e. Emigrant
    - f. Cortez Mountains (mining)
    - g. Pine Valley
    - h. Bullion Townsite and Mine
    - i. Palisade Townsite
    - j. Tonka Canyon
    - k. Carlin
    - l. Mineral Hill Mine and Townsite
    - m. Jiggs
    - n. Lee
    - o. South Fork

p. South Fork Canyon
q. West Springs
r. Fort Halleck
s. Elko-Eureka Stage Road
t. Gibson's Toll Road
u. White Pine Toll Road
v. Donner-Reed Party Trail
w. Bidwell-Bartelson Trail
x. Freemont-Carson Trail
y. Ogden Trail
z. Walker-Kern-Talbot Trail

4. Contact Planning Unit (Inventory Incomplete)
   a. Deeth Townsite
   b. Humboldt Wells Rest Area - Emigrant Trail
   c. California Emigrant Trail - Joseph Burke
   d. Metropolis Townsite
   e. Contact Mining District
   f. Delano Mining District
   g. Toana Townsite
   h. Tecoma Townsite
   i. Buell Mine and Tramroad
   j. Rowland Townsite (Boise District)
   k. Toana Hall Road

5. Currie Planning Unit (Inventory Incomplete)
   a. Walker-Kern-Talbot Trail
   b. Ogden 1829 - Trail - Beckwith 1854
   c. John Work Trail - J.C. Fremont 1843
   d. Tobar
   e. Donner-Reed Trail
   f. Proctor
   g. Shafter
   h. Sprucemont Townsite
   i. Kille-Black Forest Mines
   j. Dolly Varden-Victoria Mines
   k. Dolly Varden Townsite
   l. Dead Cedar Mine
   m. Ferber Mining District
   n. Kingsley Mine and Townsite
   o. Currie Townsite
   p. Mud Springs Mining District
   q. Overland Trail Pony Express, Hasting-Cutoff and Overland Stage and Telegraph
   r. Fort Ruby
   s. Camp Ruby

ILLUSTRATION XVIII
Historical Sites



MILES
0 10 20 30 40 50

LEGEND

○ Sites
▬ Railroads
▨ Trails
H - 1 Identification No.
H - Historical Value Area
1-Tuscarora P.U.
2-North Fork P.U.
3-Buckhorn P.U.
4-Contact P.U.
5-Currie P.U.
6-U.S.F.S. Area

6. USFS Areas (Inventory Incomplete)
    a. Walker-Kern-Talbot Trail - 1845
    b. Ogden Trail - 1829
    c. John Work Trail-1831 and Beckwith, 1854
    d. Overland Pass (Trails and Telegraph)
    e. Polar Star Mine
    f. Jarbidge Townsite and Success Mine
    g. Columbia Townsite and Golden Eagle Mine
    h. Edgemont Mines
    i. Mountain City Townsite
    j. Golden Ensign Mine
    k. Patsville Townsite
    l. Rio Tinto Mine and Townsite
    m. Coleman Canyon Mines
    n. Diamond Jim Mine

## b. Cultural Values

### Archaeological

The subject area has been inhabited by early peoples for approximately the past 10,000 years. Archaeological findings have involved primarily Indian campsites located to provide accessible food, water and shelter. Investigations in the subject area have revealed significant items such as arrowheads of different periods, pottery, spearheads and chippings. Much work remains to be done for complete inventory to determine extent and significance of this resource. Better location of known sites is not given to prevent further theft and vandalism.

The Illustration XIX depicts areas within the Elko District which contain a value or are of importance to the present day activities of subcultures existing in this District. These areas are important and have value, not because of public educational or private interests, but because they are vital to the preservation of the Indian cultures of northeast Nevada. The primary characteristics of these cultural values aid in understanding these peoples, their culture and their degree of dependency upon these values. The level of protection of these cultural values from outside influences in the subject area must be such that they will remain intact for the indefinite future.

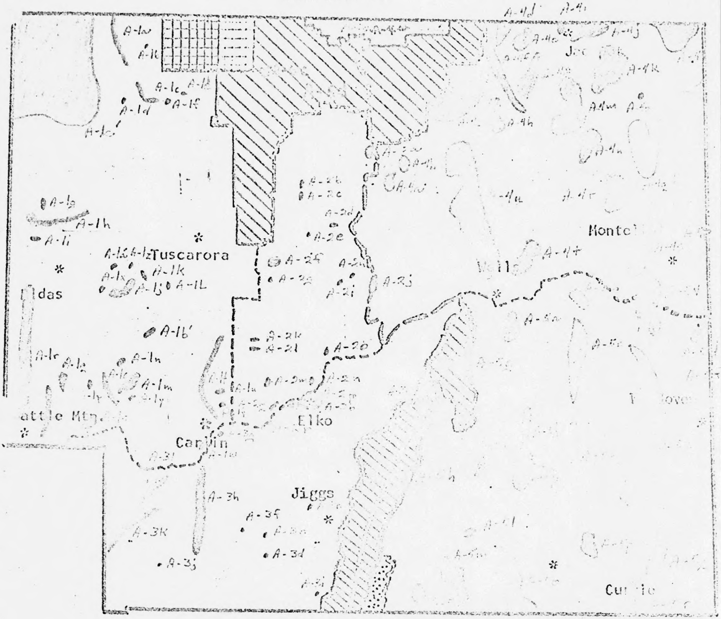
The following list of places, names and accompanying map, depicts known areas of archeological significance in the subject area. This list has been compiled through inventories by the following individuals:

| Name | Title | Organization |
|---|---|---|
| Mary Rusco | Instructor | University of Nevada - Reno |
| Don Touhy | Anthropology Curator | Nevada State Museum |
| Howard Hickson | Director - Museum | Northeast Nevada Museum |
| Bill Wright | Rancher | Anthropology M.S. Degree |
| Harry Peterson | Range Conservationist | Bureau of Land Management |

ILLUSTRATION XIX
Cultural Resources

BUREAU OF LAND MANAGEMENT

ELKO DISTRICT



* Townsites

▥ Indian Reservation

▧ National Forest

░ Ruby Marsh Wildlife Refuge

━ Resource Area Boundary

---- Planning Unit Boundary

Cultural Resources:

A- Archeological Values
1 - Tuscarora P.U.
2 - North Fork P.U.
3 - Buckhorn P.U.
4 - Contact P.U.
5 - Currie P.U.
6 - USFS Areas.
a-2 refers to specific area name

1. Tuscarora Planning Unit
    a. Lower South Fork Owyhee River
    b. Hat Peak
    c. Upper South Fork Owyhee River
    d. Chino Creek
    e. Deep Creek
    f. Spanish Ranch
    g. South Fork Humboldt River
    h. Snowstorm Mountains
    i. Midas
    j. Willow Creek Reservoir
    k. McCann Mountain
    l. Independence Valley
    m. Rosie Mine
    n. Ivanhoe Mine
    o. Rock Creek
    p. Six Mile Peak
    q. Indian Springs
    r. Hot Springs Ranch
    s. Izzenhood Ranch
    t. Sheep Creek Range
    u. Maggie Creek
    v. Swales Creek
    w. Swales Mountain
    x. Carlin
    y. Squaw Valley Ranch
    z. Boulder Valley
    a.1. Quicksilver Mine
    b.1. Willow Creek
    c.1. Owyhee Desert

2. North Fork Planning Unit
    a. Coyote Lake
    b. North Fork
    c. Holland Ranch
    d. Humboldt River
    e. Gance Creek
    f. McClelland Creek #1
    g. McClelland Creek #2
    h. Badger Spring
    i. Spring
    j. North Fork Humboldt River
    k. Long Creek
    l. Blue Basin Creek
    m. Adobe Ranch
    n. Kittridge Canyon
    o. Sherman Creek
    p. Elko
    q. Avenal
    r. South Fork

3. Buckhorn Planning Unit
    a. Halleck
    b. Grindstone
    c. Elko
    d. Peter Haues Ranch
    e. Cedar Ridge
    f. Robinson Basin
    g. Twin Springs
    h. Huntington
    i. Cottonwood Basin
    j. Pine Valley
    k. Crescent Valley
    l. Humboldt
    m. Carlin
    n. Beowawe
    o. Smith Creek

4. Contact Planning Unit
    a. Stag Mountain
    b. Stag Creek
    c. Salmon Falls Watershed
    d. Conner Reservoir
    e. Bear Mountain
    f. Salmon Falls River
    g. L&D Mountain
    h. Bad Lands
    i. Cottonwood Creek
    j. Shoshone Creek
    k. Gollaher Mountain
    l. Goose Creek
    m. Granite Range
    n. Knoll Mountain
    o. Rock Springs Creek
    p. Bald Mountain
    q. Delano Mountains
    r. Tony Mountain
    s. Toano Range
    t. Black Mountain
    u. Antelope Peak
    v. North Toana
    w. Jarbidge-Bruneau Plateaus (Boise District)

5. Currie Planning Unit
    a. Wood Hills
    b. North Pequop Mountains
    c. Pequop Mountains
    d. Pilot Peak
    e. Goshute Mountains
    f. Leppy Peak
    g. North Ruby Foothills

    h. East Ruby Foothills
    i. Valley Mountain
    j. Spruce Mountain
    k. South Pequop Mountains
    l. West Buttes
    m. Medicine Range
    n. Maveric Springs Range
    o. Cherry Creek Mountains
    p. Dolly Varden Mountains
    q. Sugar Loaf Peak
    r. Kingsley Mountains

6. USFS Areas
    a. South Ruby Range (Ruby Mountains)
    b. East Humboldt Range
    c. Allegheny Creek Site
    d. Jarbidge Mountains, Copper Mountains, Mahoganies and Independence Range

Indian Designated Pinyon-Juniper Sites

Pinyon-juniper forests which have been designated in 1971 by Raymond Yowell, Chairman of the Executive Board of the Intertribal Council of Nevada, as important ancestral pinyon pinenut production and collection areas are listed below. (See Illustration XX.)

1. Buckhorn Planning Unit
    a. Union Mountain

2. Contact Planning Unit
    a. Moor Summit

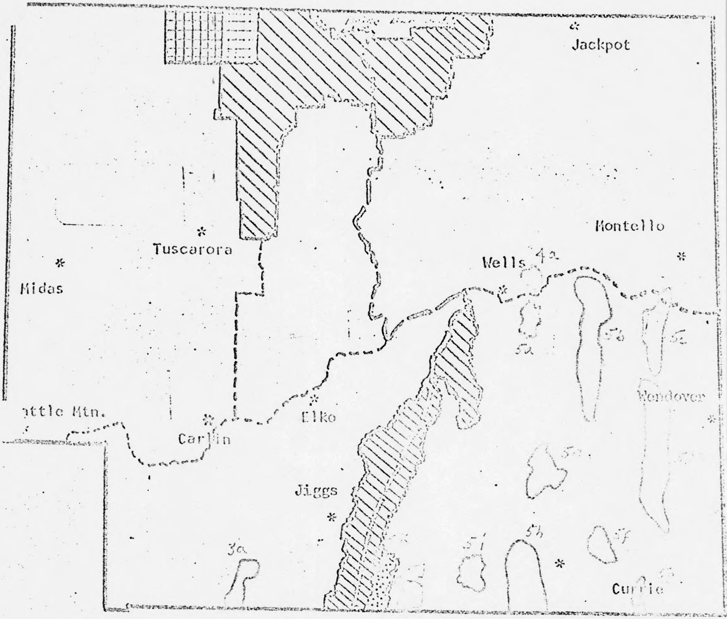
3. Currie Planning Unit
    a. Wood Hills
    b. Pequop Mountains
    c. Toano Range
    d. Goshute Mountains
    e. Spruce Mountain
    f. Dolly Varden Mountains
    g. Kingsley Mountains
    h. Cherry Creek Mountains
    i. Medicine Range
    j. Maveric Springs Range
    k. Ruby Marsh

4. USFS
    k. Ruby Marsh

ILLUSTRATION XX
Indian Culture
Pinyon-Juniper Areas

## BUREAU OF LAND MANAGEMENT

## ELKO DISTRICT



* Townsites

▦ Indian Reservation

▨ National Forest

⁘ Ruby Marsh Wildlife Refuge

— Resource Area Boundary

--- Planning Unit Boundary

Indian Designated Pinyon-Juniper Areas

3- Buckhorn P.U.
4- Contact P.U.
5- Currie P.U.
6- USFS Area

a-through k - Specific area names.

## Wild Horses

C

Several areas within the subject provide range for herds of free-roaming horses of which some bands may be determined to be wild. Preservation of this heritage is of primary concern of the land managing agencies. Refer to Section II,B,2. Page 37(a).

### c. Social Welfare

#### (1) Introduction

The following discussion on District economics, and its relationship to oil and gas geothermal development is broken into three segments: (1) Description of Elko District's economics and the relationship between contributing income sectors; (2) This segment goes beyond the normal descriptions as outlined above, and considers some of the implications that oil and gas geothermal energy development can, and will have, on District economics; and, (3) In this concluding section, discussion centers around the feasibility of geothermal development within the industry and, in Nevada, in general. The latter two subtopics belong in Section III; however, are considered for the continuity of subject and better overall understanding.

## SUMMARY AND CONCLUSIONS [1]

Since economic data is available on a county basis, it will be necessary for statistical purposes to include only Elko County as the dominant county within the District Statistical Region. However, data is displayed for Lander and Eureka counties. Table S identifies and displays the basic natural resource economic data for the region. The term "Public Lands" is used to refer to "National Resource Lands," i.e., those lands managed by the Bureau of Land Management.

### Population

The total population of the District in 1970 was about 16,910 people, and this accounts for about 3 percent of the state total. As regards to population densities, the subject area is sparsely populated with an average density per square mile of 0.8 people compared to 4.4 for the state.

The population is projected to increase to about 19,400 people, or about 14 percent by 1980. The majority of this population is expected to take place around the city of Elko and the south-central part of the District. See Illustration XXI and Tables 1 and 2.

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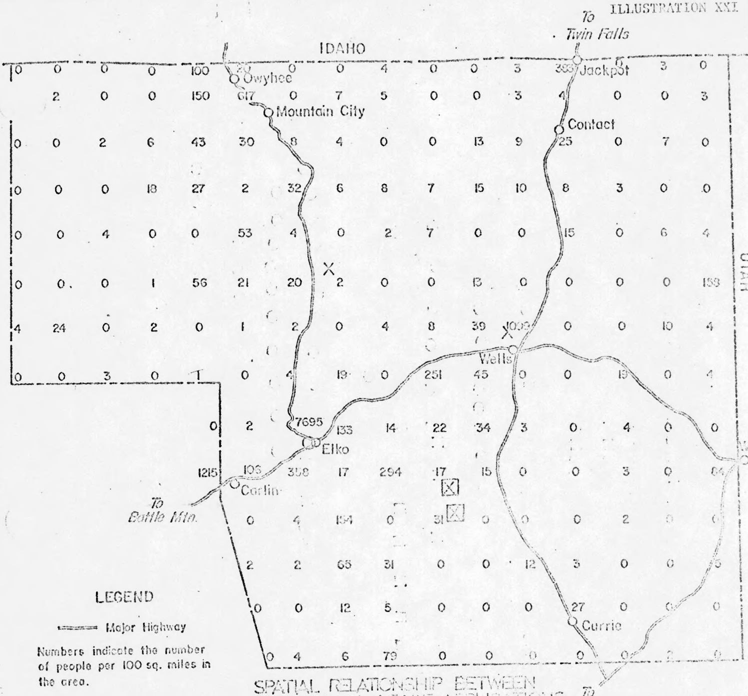
[1] Data from this section extracted from Elko District Economic Supplement.



LEGEND

═══ Major Highway

Numbers indicate the number of people per 100 sq. miles in the area.

Source: S.T. Bradhurst,
Mocky School of Mines
University of Nevada, Reno

X APPLICATION

○ USGS KGRA

☐ COMPETITIVE KGRA

EXPIRES FY-74

○ NEW APPLICATIONS FILED FY-74

SPATIAL RELATIONSHIP BETWEEN
GEOTHERMAL LEASE APPLICATIONS
AND POPULATION DISTRIBUTION

OIL & GAS LEASE APPLICATIONS

Figure I
1970 POPULATION DISTRIBUTION, ELKO COUNTY

ILLUSTRATION XXI
Population Distribution

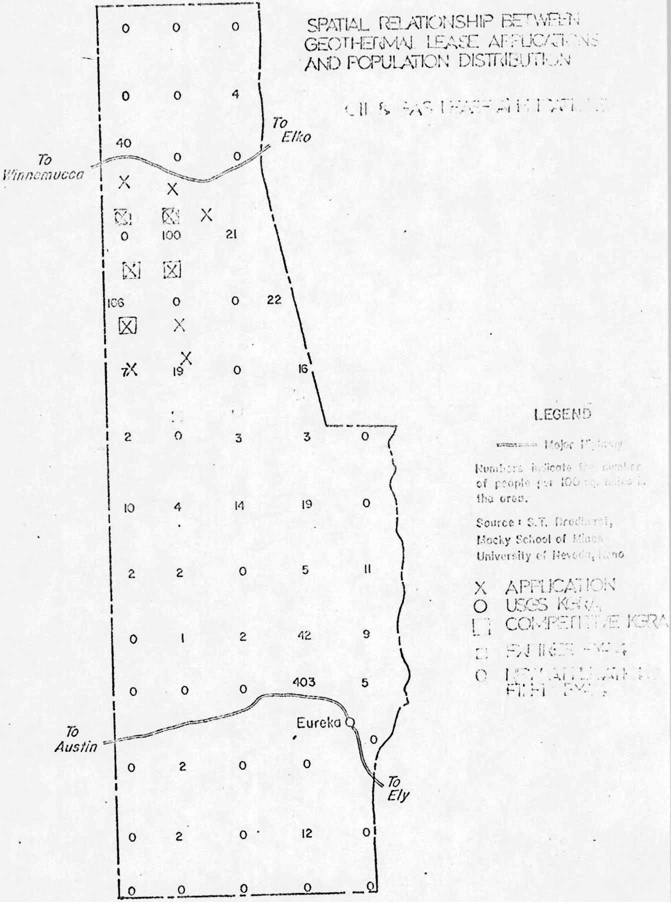
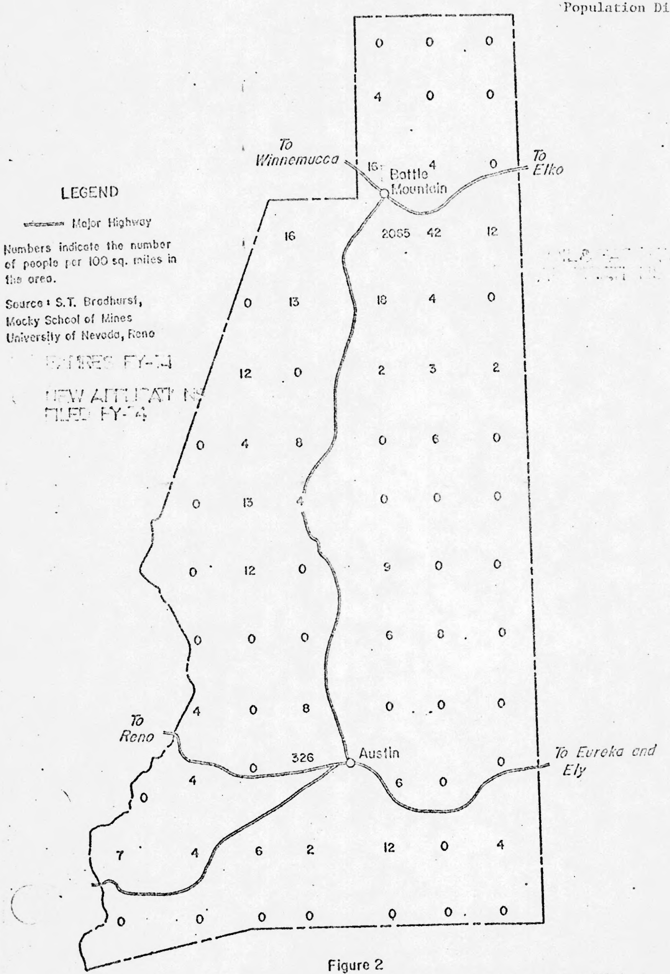

SPATIAL RELATIONSHIP BETWEEN
GEOTHERMAL LEASE APPLICATIONS
AND POPULATION DISTRIBUTION
OIL & GAS LEASE APPLICATIONS
To Elko
To Winnemucca
To Austin
To Ely
Eureka
0 0 0
0 0 4
40 0 0
X X
X X X
0 100 21
X X
166 0 0 22
X X
7 X 19 0 16
2 0 3 3 0
10 4 14 19 0
2 2 0 5 11
0 1 2 42 9
0 0 0 403 5
0
0 2 0 0
0 2 0 12 0
0 0 0 0 0
LEGEND
Major Highway
Numbers indicate the number of people per 100 sq. miles in the area.
Source: S.T. Brodhurst, Mackay School of Mines University of Nevada, Reno
X APPLICATION
O USGS KGRA
COMPETITIVE KGRA

Figure I

1970 POPULATION DISTRIBUTION, EUREKA COUNTY



EXPIRES FY-74

NEW APPLICATIONS FILED FY-74

Figure 2
1970 POPULATION DISTRIBUTION, LANDER COUNTY

TABLE 1

AREA, POPULATION AND POPULATION PROJECTIONS BY BLM REGIONS, NEVADA

| D.S.R. | Area (Square Miles) | Region As Percent of Total Land Area | 1970 |  |  | 1980 Projected |  |  |
|---|---|---|---|---|---|---|---|---|
|  |  |  | Population[a] | Region Population as Percent of State | Density Per Square Mile By Region[b] | Population[c] | Region Population as Percent of State | Density Per Square Mile By Region |
| Nevada | 109,889 | 100.0 | 488,738 | 100.0 | 4.4 | 694,499 | 100.0 | 6.3 |
| Elko | 17,162 | 15.7 | 13,958 | 2.9 | 0.8 | 15,882 | 2.2 | 0.9 |
| Winnemucca | 15,703 | 14.2 | 9,045 | 1.8 | 0.6 | 10,292 | 1.5 | 0.7 |
| Carson | 18,159 | 16.5 | 169,898 | 34.8 | 9.3 | 236,500 | 34.0 | 13.0 |
| Ely | 8,904 | 8.2 | 10,150 | 2.0 | 1.1 | 11,549 | 1.7 | 1.3 |
| Las Vegas | 22,093 | 20.1 | 276,474 | 56.6 | 12.5 | 408,158 | 58.8 | 18.5 |
| Battle Mountain | 27,867 | 25.3 | 9,213 | 1.9 | 0.3 | 12,118 | 1.8 | 0.4 |

[a] U.S. Bureau of Census, U.S. Census of Population: 1970, Number of Inhabitants, Final Report PC (1) - A30, Nevada.

[b] Density figures reflect average densities only.

[c] Bureau of Business and Economic Research, University of Nevada, Reno, 1971, by Dr. S. F. Chu.

68(6)

TABLE 2

TRENDS AND COMPONENTS OF POPULATION CHANGE BY BLM REGIONS, NEVADA

| D.S.R. | Population Trend | | | Components of Change, 1960-70 | | |
|---|---|---|---|---|---|---|
| | 1960 | 1970 | Percent Increase | Natural Increase | Net Migration | Percent |
| Nevada | 285,278 | 488,738 | 71.3 | 91,030 | 143,733 | 50.4 |
| Elko | 12,011 | 13,958 | 16.2 | 3,040 | 216 | 1.8 |
| Winnemucca | 8,907 | 9,045 | 1.5 | 2,074 | -775 | -8.7 |
| Carson | 117,779 | 169,898 | 44.2 | 30,422 | 34,729 | 29.4 |
| Ely | 9,808 | 10,150 | 3.5 | 1,977 | -792 | -8.1 |
| Las Vegas | 130,066 | 276,474 | 112.6 | 52,024 | 108,458 | 83.3 |
| Battle Mountain | 6,707 | 9,213 | 37.3 | 1,493 | 1,897 | 28.2 |

Source: U.S. Bureau of the Census, Census of Population: 1970 Census of Population and Housing.

## Income

Total personal income for the District Statistical Region is about $40 million, or 2.5 percent of the total for the state. Per capita personal income is $3,089. The median family income for the region is $9,945 which is lower than the state average of $10,692. It also appears that about 8 percent of the families have incomes below the poverty level of $3,000 per year income level, which is a reasonable approximation of the average family poverty level.

The most important sectors from the standpoint of personal income produced are, in order of importance: tourist-related services, agriculture, services, and government. The lowest contributors are manufacturing, finance and insurance and real estate. See Tables 3, 4, 5 and 6.

## Employment

In 1970, total civilian employment within the Elko District amounted to 6,000 people, or about 3 percent of the total for the state. The major employment sectors, in descending order of importance are: tourist-related services; services; trade; agriculture with manufacturing; and finance, insurance and real estate at the lower end of the employment scale. See Table 7.

Mining employment in 1970 contributed only around 5 percent of the total employment, but if projections as to increased mining production materialize, then the region will see a substantial increase in mining income employment. See discussion concerning geothermal development.

## Minerals

The total value of mineral production in the District Statistical Region for 1970 was about $360,000; about $220,000 or 61 percent was produced from public lands.

ELKO REGION ESTIMATED PERSONAL INCOME BY INDUSTRIAL SOURCE, 1969

| Item | Amount | Percent of Total Region Allocable Income | Percent of Total Region Personal Income | Region as Percent of State Total by Industrial Source | Industrial Source as Percent of Total Nevada Allocated Personal Income | Nevada Total Personal Income by Industrial Source |
|---|---|---|---|---|---|---|
| Industry | | | | | | |
| Agriculture[a] | $ 5,339,323 | 13.37 | 12.38 | 31.00 | 0.34 | $ 17,219,361 |
| Mining[b] | 2,752,756 | 6.89 | 6.38 | 8.56 | 0.17 | 32,126,112 |
| Construction[b] | 3,051,594 | 7.64 | 7.08 | 1.72 | 0.19 | 176,854,900 |
| Manufacturing[b] | 625,680 | 1.63 | 1.51 | 0.75 | 0.04 | 86,232,382 |
| Public utilities[c] | 4,332,510 | 10.85 | 10.05 | 3.48 | 0.27 | 124,437,771 |
| Trade[d] | 3,643,440 | 9.12 | 8.45 | 2.10 | 0.23 | 173,067,361 |
| Finance, insurance and real estate[e] | 1,030,561 | 2.58 | 2.39 | 1.75 | 0.06 | 58,838,250 |
| Services[f] | 5,155,487 | 12.91 | 11.96 | 1.82 | 0.32 | 282,447,610 |
| Tourist-related services[g] | 6,245,825 | 15.64 | 14.49 | 1.61 | 0.39 | 387,126,674 |
| Government[h] | 4,567,810 | 11.44 | 10.59 | 3.71 | 0.29 | 122,845,830 |
| Military[i] | 45,000 | 0.11 | 0.10 | 0.07 | n | 61,599,000 |
| Transfer payments[j] | 3,124,920 | 7.82 | 7.25 | 3.03 | 0.19 | 102,806,989 |
| Region | | | | | | |
| Total allocated personal income | $ 39,941,906 | | 92.64 | | | |
| Unallocated personal income[k] | 3,174,356 | | 7.36 | | | |
| Total personal income[l] | 43,116,262 | | | | | |
| Nevada | | | | | | |
| Total allocated personal income[m] | $1,625,602,240 | | | | | |
| Total personal income[l] | 1,744,794,660 | | | | | |
| Region total allocated personal income as percent of State total allocated personal income | | 2.55 | | | | |

Source: Unpublished research, Stanley G. Detering, Division of Agricultural and Resource Economics, University of Nevada, Reno, January 1973. District income data aggregated from county and state income data.

(69(a)

## TABLE 4

### INCOME AND POVERTY STATUS BY COUNTY, NEVADA, 1969

| County | Total Personal Income[a] | Per Capita Personal Income | Family Median Income | Percent of Families by Cash Income Group | | | | | | Percent of All Families With Income Less Than Poverty Level |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 0 to $2,999 | $3,000 to $4,999 | $5,000 to $7,999 | $8,000 to $9,999 | $10,000 to $15,000 | $15,000 and Over | |
| United States[b] | $797,100,000,000 | $3,910 | $ 9,433 | 9.3 | 10.7 | 14.0 | 20.1 | 26.7 | 19.2 | 14.9 |
| Nevada | 1,744,794,660 | 3,570 | 10,692 | 6.8 | 8.0 | 17.0 | 13.7 | 29.4 | 25.1 | 7.0 |
| Churchill | 30,004,102 | 2,854 | 8,263 | 10.4 | 14.7 | 23.3 | 12.0 | 24.4 | 15.2 | 10.3 |
| Clark | 969,079,248 | 3,546 | 10,870 | 6.8 | 7.5 | 16.8 | 13.1 | 29.5 | 26.3 | 7.0 |
| Douglas | 28,904,400 | 4,200 | 10,773 | 5.5 | 9.0 | 20.0 | 10.0 | 29.0 | 26.5 | 5.7 |
| Elko | 43,116,262 | 3,089 | 9,945 | 7.5 | 8.2 | 17.7 | 17.1 | 31.5 | 18.0 | 8.2 |
| Esmeralda | 2,173,824 | 3,456 | 8,545 | 16.3 | 14.4 | 13.4 | 23.0 | 30.0 | 2.9 | 10.6 |
| Eureka | 2,388,012 | 2,519 | 8,768 | 11.1 | 4.2 | 26.2 | 20.5 | 31.0 | 7.0 | 10.4 |
| Humboldt | 19,156,875 | 3,005 | 8,788 | 8.6 | 11.6 | 22.2 | 15.8 | 25.9 | 15.9 | 7.5 |
| Lander | 7,038,894 | 2,659 | 8,641 | 18.0 | 7.4 | 16.0 | 23.9 | 26.3 | 8.4 | 18.9 |
| Lincoln | 6,535,692 | 2,556 | 8,864 | 14.0 | 10.4 | 17.9 | 19.3 | 23.5 | 14.9 | 11.9 |
| Lyon | 24,753,431 | 3,011 | 9,334 | 6.4 | 11.4 | 19.6 | 20.1 | 27.1 | 15.4 | 9.7 |
| Mineral | 22,520,894 | 3,194 | 10,172 | 7.0 | 8.1 | 14.7 | 19.0 | 29.3 | 21.9 | 6.9 |
| Nye | 21,522,556 | 3,844 | 10,224 | 6.0 | 6.5 | 19.0 | 17.0 | 31.0 | 20.5 | 5.9 |
| Pershing | 8,207,580 | 3,074 | 9,181 | 10.0 | 8.3 | 17.7 | 19.9 | 23.4 | 20.7 | 11.3 |
| Storey | 2,514,510 | 3,618 | 11,867 | 5.1 | 5.8 | 13.7 | 16.2 | 25.4 | 33.8 | 2.6 |
| Washoe | 471,923,064 | 3,898 | 11,152 | 6.1 | 7.8 | 15.9 | 12.6 | 30.0 | 27.6 | 5.9 |
| White Pine | 28,633,150 | 2,821 | 9,111 | 7.7 | 7.0 | 24.7 | 19.0 | 29.0 | 12.6 | 7.3 |
| Carson City | 56,380,860 | 3,645 | 11,324 | 6.0 | 6.8 | 14.0 | 14.0 | 31.2 | 28.0 | 6.0 |

---

[a] Source: U.S. Bureau of the Census, Census of Population: 1970 General Social and Economic Characteristics, Final Report, PC (1) - C30, Nevada. Total personal income derived by multiplying area population counts by per capita personal income.

[b] U.S. Bureau of the Census, Statistical Abstract of the United States: 1971 (92nd Edition), Washington, D.C., 1971.

## Corrections of Table 4

U.S. and Nevada personal income estimates shown in Table 4 were from different sources and are, therefore, not comparable. To assure comparability the figures in Table 4 should be changed to:

U. S. per capita income -- $3,139

U. S. median family income - $9,590

These estimates are based upon the census taken in 1970 and represent income received during calendar year 1969.[c]

TABLE 5

## ESTIMATED PERSONAL INCOME BY DISTRICT RESIDENTS AND NATIONAL RESOURCE LAND INCOME BY RESOURCE USE, 1970

| D.S.R. | District Income | | Personal Income from National Resource Lands | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | All NRL Income | | Income by Use | | | | Percent of District NRL Income | | | |
| | Total | % of State Income | Total Total | % of Dist. Income | Lvsk Forage | Outdoor Recreat. | Wildlife Hunting | Mineral Extract | Lvsk Forage | Outdoor Recreat. | Wildlife Hunting | Mineral Extract. |
| | ($1,000) | | ($1,000) | | ($1,000) | ($1,000) | ($1,000) | ($1,000) | | | | |
| Elko | 43,116 | 2.47 | 3,248 | 7.52 | 1,295 | 137 | 131 | 1,684 | 39.88 | 4.22 | 4.04 | 51.86 |
| Winnemucca | 27,364 | 1.57 | 1,956 | 7.15 | 866 | 122 | 37 | 930 | 44.30 | 6.25 | 1.88 | 47.57 |
| Carson | 673,001 | 36.51 | 4,340 | 0.68 | 264 | 1,358 | 71 | 2,647 | 6.08 | 31.30 | 1.64 | 60.98 |
| Ely | 28,663 | 1.64 | 1,139 | 3.97 | 490 | 37 | 34 | 578 | 42.99 | 3.28 | 3.00 | 50.72 |
| Las Vegas | 977,788 | 56.03 | 3,765 | 0.39 | 86 | 698 | 40 | 2,941 | 2.34 | 18.53 | 1.05 | 78.08 |
| Battle Mt. | 30,999 | 1.78 | 3,556 | 11.43 | 351 | 30 | 32 | 3,143 | 9.88 | 0.83 | 0.89 | 88.40 |
| State Total | 1,744,797 | 100.00 | 18,005 | | 3,354 | 2,383 | 344 | 11,923 | | | | |
| State Average | | | | 1.03[a] | | | | | 18.63 | 13.24 | 1.91 | 66.22 |

[a] Percent of state income from National Resource Lands.

## TABLE 6

## DISTRICT STATISTICAL REGION SHARE OF NEVADA NRL PERSONAL INCOME BY RESOURCE CATAGORY

| DSR | NRL Personal Income | Resource Use | | | | % of State NRL Income |
|---|---|---|---|---|---|---|
| | | Livestock Forage | Outdoor Recreation | Wildlife Hunting | Mineral Extraction | |
| | ($1,000) | - - - - - - - - - - | - -Percent- - | - - - - - - - - - - | | |
| Elko | 3,248 | 38.62 | 5.75 | 38.06 | 14.13 | 18.04 |
| Winnemucca | 1,956 | 25.83 | 5.13 | 10.68 | 7.80 | 10.86 |
| Carson | 4,340 | 7.86 | 57.02 | 20.60 | 22.20 | 10.86 |
| Ely | 1,139 | 14.60 | 1.57 | 9.92 | 4.84 | 6.33 |
| Las Vegas | 3,765 | 2.62 | 29.29 | 11.48 | 24.66 | 20.92 |
| Battle Mt. | 3,556 | 10.47 | 1.24 | 9.26 | 26.36 | 19.75 |
| State Total | 18,005 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

TABLE 7

ELKO REGION EMPLOYMENT BY INDUSTRIAL SECTOR, 1970

| Item | Total District Sector Employment | Total State Sector Employment | Total District Employment By Sector as Percent of All Industrial Sector Employment | Total District Employment By Sector as Percent of Total District Employment | Total District Employment By Sector as Percent of Total State Employment |
|---|---|---|---|---|---|
| Industry | | | | | |
| Agriculture | 698 | 4,786 | 14.58 | 12.24 | 0.35 |
| Mining | 278 | 3,708 | 7.49 | 4.87 | 0.14 |
| Construction | 351 | 16,270 | 2.15 | 6.16 | 0.17 |
| Manufacturing | 111 | 10,357 | 1.07 | 1.95 | 0.05 |
| Public utilities | 630 | 15,357 | 4.10 | 11.04 | 0.31 |
| Trade | 816 | 30,209 | 2.70 | 14.31 | 0.41 |
| Finance, insurance and real estate | 161 | 8,258 | 1.94 | 2.83 | 0.08 |
| Services | 997 | 39,815 | 2.50 | 17.48 | 0.50 |
| Tourist-related services | 1,251 | 54,571 | 2.29 | 21.94 | 0.63 |
| Government | 410 | 14,478 | 2.83 | 7.18 | 0.20 |
| Total district employment | 5,703 | | | | |
| Total State employment | | 197,809 | | | |
| Total district employment as percent of total State employment | 2.88 | | | | |

Source: U.S. Bureau of the Census, Census of Population: 1970 General Population Characteristics. District figures aggregated from county data.

The region is dependent on the mining industry for nearly 7 percent of its total personal income. Income generated by the mining industry is about $2.8 million out of nearly $40 million in total personal income. Mining industry income generated from public lands is about $1.7 million. This represents over 4 percent of the region's total personal income attributable to mining operations on public lands. If income from lands patented from the public lands were considered, community dependence on public lands becomes of major significance.

Although mining produces only a relatively small part of the communities' total personal income, it should be recognized that mineral products are basic resources required either directly or indirectly in almost all other sectors of economic activity.

The demand for mineral production in terms of value of minerals produced in 1970 constant dollars is projected to increase a phenomenal 5,000 percent from 1970-80. In order to maintain its current share of production, an increase of $13 million from public lands would be required. Because of the uncertainty of mineral deposits, no attempt is made to indicate the potential for public lands to meet the projected increase in demand. See Tables 8, 9, 10, 11, 12 and 13.

## Industry Comparisons

Slightly different monetary measures are used in computing resource industry dependence on public land resources (see Table 14). These resources are reasonably comparable, however, because each represents the gross money exchange in the local economy for the initial product either to or from the initial producer or user.

Considering total money exchanged, the resource industries in descending order of importance are: livestock, general recreation, hunting and mining. This order also applies as regards the industry importance of production from public lands (see Table 14).

TABLE 8

MINERAL PRODUCTION STATISTICS BY COMMODITY, ELKO DISTRICT, 1970, 1980, AND 2000

| Commodity and Unit | Number of Mines | Units of Product | Number Employed | Value at 1970 Prices (Amounts in Thousands) |
|---|---|---|---|---|
| Copper, sand and gravel | | | | |
| 1970 total[a] | 2 | | 8 | $ 360 |
| Copper, tons | 1 | 6,000 | 180 | 6,960 |
| Tungsten, tons | 1 | 400 | 80 | 2,800 |
| Vanadium, tons | 1 | 1,500 | 75 | 10,800 |
| Barite, tons | 2 | 100,000 | 50 | 750 |
| Sand and gravel, tons | 1 | 334,000 | 7 | 334 |
| 1980 total | 6 | | 392 | $21,644 |
| Beryllium, tons | 1 | 100 | 30 | $ 1,520 |
| Copper, tons | 2 | 8,100 | 240 | 9,280 |
| Tungsten, tons | 1 | 800 | 160 | 5,600 |
| Uranium, tons $U_3O_8$ | 1 | 50 | 50 | 600 |
| Vanadium, tons | 1 | 2,000 | 100 | 14,400 |
| Barite, tons | 3 | 150,000 | 75 | 1,125 |
| Industrial sand, tons | 1 | 400,000 | 88 | 2,000 |
| Sand and gravel, tons | 2 | 440,000 | 9 | 440 |
| Geothermal power, MWH | 1 | 160,000 | 30 | 800 |
| 2000 total | 13 | | 782 | $35,765 |

[a] Statistics for individual items withheld to avoid disclosing confidential data.

Source: To be published planning report, Forecast for the Future, Mining, prepared by the State Engineers Office as part of the development of the State Water Plan.

TABLE 9

MINERAL PRODUCTION STATISTICS BY COMMODITY, LANDER COUNTY, 1970, 1980 AND 2000

| Commodity and Unit | Number of Mines | Units of Product | Number Employed | Value at 1970 Prices (Amounts in Thousands |
|---|---|---|---|---|
| Copper, gold and silver, mercury, barite, fluorspar, sand and gravel, gems and semiprecious stones 1970 total[a] | 11 | | 446 | $20,433 |
| Copper, tons | 1 | 15,000 | 502 | $17,400 |
| Gold and silver, tons ore | 1 | 600,000 | 91 | 6,000 |
| Barite, tons | 5 | 200,000 | 100 | 1,500 |
| Sand and gravel, tons | 1 | 49,000 | 1 | 49 |
| Zeolites, tons | 1 | 75,000 | 35 | 3,750 |
| Gems and semiprecious stones, tons | 1 | | 1 | 5 |
| Geothermal power, MWH | 1 | 80,000 | 15 | 400 |
| 1980 total | 11 | | 745 | $29,104 |
| Copper, tons | 2 | 30,000 | 952 | $34,800 |
| Gold and silver, tons ore | 1 | 200,000 | 100 | 2,000 |
| Uranium, tons $U_{308}$ | 1 | 100 | 100 | 1,200 |
| Barite, tons | 5 | 400,000 | 200 | 3,000 |
| Sand and gravel, tons | 1 | 60,000 | 1 | 60 |
| Zeolites, tons | 1 | 450,000 | 60 | 22,500 |
| Gems and semiprecious stones, tons | 2 | | 4 | 20 |
| Geothermal power, MWH | 1 | 400,000 | 30 | 2,000 |
| 2000 total | 14 | | 1,447 | $65,580 |
| Copper, tons | 2 | 40,000 | 1,200 | $46,400 |
| Uranium, tons $U_{308}$ | 1 | 200 | 200 | 2,400 |
| Barite, tons | 5 | 500,000 | 250 | 3,250 |
| Sand and gravel, tons | 1 | 49,000 | 1 | 49 |
| Zeolites, tons | 1 | 450,000 | 60 | 22,500 |
| Gems and semiprecious stones, tons | 2 | | 4 | 20 |
| Geothermal power, MWH | 1 | 560,000 | 30 | 2,800 |
| Saline playa products, tons | 1 | 50,000 | 50 | 10,000 |
| 2020 total | 14 | | 1,795 | $87,919 |

[a] Statistics for individual items withheld to avoid disclosing confidential data.

Source: To be published planning report, Forecast for the Future, Mining, prepared by the State Engineers Office as part of the development of the State Water Plan.

## TABLE 10

## MINERAL PRODUCTION STATISTICS BY COMMODITY, EUREKA COUNTY, 1970, 1980 AND 2000

| Commodity and Unit | Number of Mines | Units of Product | Number Employed | Value at 1970 Prices (Amounts in Thousands) |
|---|---|---|---|---|
| Antimony, gold and silver, iron ore, barite, sand and gravel 1970 total[a] | 5 |  | 198 | $ 8,644 |
| Gold and silver, tons ore | 1 | 750,000 | 152 | $ 7,500 |
| Iron ore, long tons | 1 | 100,000 | 25 | 1,000 |
| Sand and gravel, tons | 1 | 12,000 | 1 | 12 |
| 1980 total | 3 |  | 178 | $ 8,512 |
| Gold and silver, tons ore | 2 | 1,150,000 | 352 | $11,500 |
| Iron ore, long tons | 1 | 50,000 | 13 | 500 |
| Lead and zinc, tons | 1 | 20,000 | 28 | 6,200 |
| Vanadium, tons | 1 | 1,000 | 50 | 7,200 |
| Barite, tons | 1 | 25,000 | 13 | 187 |
| Sand and gravel, tons | 1 | 20,000 | 1 | 20 |
| 2000 total | 7 |  | 457 | $25,607 |
| Gold and silver, tons ore | 2 | 1,000,000 | 500 | $10,000 |
| Iron ore, long tons | 1 | 500,000 | 127 | 5,000 |
| Lead and zinc, tons | 1 | 40,000 | 56 | 12,400 |
| Vanadium, tons | 2 | 3,000 | 150 | 21,600 |
| Barite, tons | 2 | 200,000 | 100 | 1,500 |
| Sand and gravel, tons | 1 | 24,000 | 1 | 24 |
| Geothermal power, KWH | 1 | 160,000 | 30 | 800 |
| 2020 total | 10 |  | 964 | $51,324 |

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[a] Statistics for individual items withheld to avoid disclosing confidential data.

Source: To be published planning report, Forecast for the Future, Mining, prepared by the State Engineers Office as part of the development of the State Water Plan.

## TABLE 11

## VALUE OF MINERAL PRODUCTION BY BLM REGION AND COUNTY, 1970

| D.S.R. | County | | Total Value of Mineral Production[a] | Percent of County Managed by BLM[b] | | Value of BLM Mineral Production[c] | Mining Industry Dependence on Public Land Production[d] |
|---|---|---|---|---|---|---|---|
| Elko | Elko | | $ 360,000 | 61.2 | | $ 220,320 | |
| | | Total | 360,000 | | Total | 220,320 | 61.2 |
| Winnemucca | Humboldt | | 1,457,000 | 68.5 | | 998,045 | |
| | Pershing | | 12,501,000 | 75.5 | | 9,438,255 | |
| | | Total | 13,958,000 | | Total | 10,436,300 | 74.7 |
| Carson City | Washoe | | 2,921,000 | 62.4 | | 1,822,704 | |
| | Carson City | | 395,000 | 44.8 | | 176,960 | |
| | Douglas | | 4,937,000 | 38.2 | | 1,885,934 | |
| | Storey | | 322,000 | 10.3 | | 33,166 | |
| | Lyon | | 46,117,000 | 1.5 | | 714,033 | |
| | Churchill | | 346,000 | 73.0 | | 252,580 | |
| | Mineral | | 337,000 | 70.4 | | 237,248 | |
| | | Total | 55,375,000 | | Total | 5,122,625 | 9.2 |
| Ely | White Pine | | 57,218,000 | 9.9 | | 5,697,768 | |
| | | Total | 57,218,000 | | Total | 5,697,768 | 9.9 |
| Las Vegas | Clark | | 11,597,000 | 52.3 | | 6,065,231 | |
| | Lincoln | | 251,000 | 83.1 | | 208,581 | |
| | Esmeralda | | 4,063,000 | 92.8 | | 3,770,464 | |
| | | Total | 15,911,000 | | Total | 10,044;276 | 63.1 |
| Battle Mountain | Lander | | 20,433,000 | 27.0 | | 5,512,006 | |
| | Eureka | | 8,644,000 | 76.3 | | 6,595,372 | |
| | Nye | | 4,172,000 | 59.2 | | 2,469,824 | |
| | | Total | 33,249,000 | | Total | 14,577,202 | 43.8 |
| Nevada | | | $176,071,000 | 26.1 | | $46,098,491 | 26.1 |

[a] See Tables 23.

[b] Taken from 1970 Nevada Land Statistics. Exceptions noted for Lyon and White Pine Counties, see Table 86, Footnote b.

[c] Column 2 x Column 1.

[d] Column 3 ÷ Column 1. Industry dependence concerned only with private vs. public land mineral value production. Industry dependence in Table 86 concerned only with income dependency between private and public sector mining.

## TABLE 12

## COMMUNITY AND INDUSTRY DEPENDENCE ON MINERAL PRODUCTION BY BLM REGION, 1969

| D.S.R. | Total Income | | Mining Industry Dependence on BLM Administered Public Lands (%)[b] | Derived Personal Income From Public Lands[c] |
|---|---|---|---|---|
| | Personal[a] | Mining[a] | | |
| Elko | $ 39,941,906 | $ 2,752,756 | 61.20 | $ 1,684,687 |
| Winnemucca | 24,235,278 | 2,340,042 | 40.00 | 930,580 |
| Carson City | 530,227,240 | 9,820,115 | 26.95 | 2,646,937 |
| Ely | 27,090,787 | 5,805,682 | 9.95 | 577,665 |
| Las Vegas | 912,594,610 | 5,281,296 | 55.68 | 2,940,636 |
| Battle Mountain | 33,041,497 | 7,035,488 | 44.67 | 3,142,941 |
| Nevada | 1,567,131,318 | 33,035,379 | 34.33 | 11,923,446 |

[a] See Table 15.

[b] Dependency here assumes that the ratio of BLM administered land within a district is the same as mining industry dependency on public lands. Exceptions noted where copper extractions dominated the mining industry. These activities were assumed to be on private land solely, e.g., copper mining in Lyon and White Pine Counties. This dependency indicates the ratio of columns 5 and 7.

[c] Column 3 times column 2. See text for rationale.

## TABLE 13

## COMMUNITY AND INDUSTRY DEPENDENCE ON MINERAL PRODUCTION BY COUNTY, NEVADA, 1969

| County | Total Income Personal[a] | Total Income Mining[a] | Mining Industry Dependence on BLM Administered Public Lands (%)[b] | Derived Personal Income From Public Lands[c] |
|---|---|---|---|---|
| Carson City | $ 44,309,151 | $ 199,340 | 44.8 | $ 89,304 |
| Churchill | 26,330,053 | 142,186 | 73.0 | 103,796 |
| Clark | 904,452,988 | 4,758,951 | 52.3 | 2,488,931 |
| Douglas | 22,356,405 | 104,797 | 38.2 | 40,032 |
| Elko | 39,941,906 | 2,752,756 | 61.2 | 1,684,687 |
| Esmeralda | 1,876,109 | 181,818 | 92.8 | 168,727 |
| Eureka | 3,110,374 | 587,384 | 76.3 | 448,174 |
| Humboldt | 16,110,033 | 1,159,314 | 68.5 | 794,130 |
| Lander | 7,523,438 | 3,486,054 | 27.0 | 941,234 |
| Lincoln | 6,265,513 | 340,527 | 83.1 | 282,978 |
| Lyon | 20,959,775 | 5,672,712 | 1.5 | 85,090 |
| Mineral | 21,049,212 | 737,352 | 70.4 | 519,096 |
| Nye | 22,407,985 | 2,962,050 | 59.2 | 1,753,533 |
| Pershing | 8,125,245 | 1,180,728 | 75.5 | 136,450 |
| Storey | 2,043,832 | 76,283 | 10.3 | 7,857 |
| Washoe | 393,178,881 | 2,887,440 | 62.4 | 1,801,762 |
| White Pine | 27,090,787 | 5,805,682 | 9.9 | 574,762 |
| Nevada | 1,567,131,318 | 33,035,379 | 34.3 | 11,923,666[d] |

[a] See Table 15. Data listed for other counties used for comparison purposes.

[b] See footnote d, Table 85 for explanation of dependency.

[c] Column 3 times column 2. See text for rationale.

[d] Column 4 does not add to total due to rounding of percentage figure in column 3.

## TABLE 14

## SUMMARY TABLE

| Item | District Total | Public Lands |
|---|---|---|
| Present Resource Consumption | | |
| Livestock Forage (AUM's) | 2,869,759 | 736,826 |
| General Recreation (Recreational Days) | 465,898 | 124,477 |
| Hunting (Hunter Days) | 106,360 | 60,545 |
| Mining | [a] | [a] |
| Monetary Measures Used in Computing Industry Dependence | | |
| Value of Livestock Products Sold | $16,272,700 | $4,177,203 |
| General Recreation (Local Expenditures) | 1,966,089 | 525,291 |
| Hunting (local Expenditures) | 882,788 | 502,523 |
| Mining (Value of Products Sold) | 360,000 | 220,320 |
| Dependence of Resource Based Industries On Public Lands | | |
| Livestock (Percent) | | 25.67 |
| General Recreation (Percent) | | 26.71 |
| Hunting (Percent) | | 57.00 |
| Mining (Percent) | | 62.20 |
| Personal Income Attributable to the Resource Product | | |
| Total District Personal Income | $39,941,906 | |
| Livestock Forage | 5,046,048 | 1,295,321 |
| General Recreation | 513,149 | 137,062 |
| Hunting | 230,408 | 131,158 |
| Mining | 2,752,756 | 1,684,687 |
| Community Dependence on Resource Products | | |
| Livestock (Percent) | 12.633 | 3.243 |
| General Recreation (Percent) | 1.231 | 0.317 |
| Hunting (Percent) | 0.535 | ~~0.030~~ 0.364 |
| Mining (Percent) | 6.891 | 4.217 |
| Total Community Dependence | 21.290 | 7.807 |
| Benchmark Projections--1980 | | |
| Livestock Forage (AUM's) | | 751,630 |
| General Recreation (Recreational Days) | | 318,763 |
| Hunting (Hunter Days) | | 68,821 |
| Mining (Dollars) | | 13,246,128 |

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[a] Not available in common units of measure because of the variety of minerals.

The economy of the region depends upon the four resource sectors for about 21 percent of its total personal income. The contributions from hunting is of minor significance producing less than one percent of the total personal income within the region. The most significant sectors are livestock and mining, producing 13 percent and 7 percent of the region's income, respectively.

Community dependence on public lands to generate these incomes is quite significant (nearly 8 percent of the total personal income). Mining and livestock production are the most significant sectors producing nearly 4 percent and 3 percent, respectively. Although personal income generated from public lands appears relatively insignificant compared to total personal income, it does produce $3.2 million to local communities.

It must also be remembered that initial users of the forage resource depend on this resource for at least part of their livelihood. This importance distinction is shared by some users of the mineral resource and separates this dependence from the kind typical of the initial users of recreation and hunting resources. In the latter cases, the dependence does not affect the initial users' livelihood. Secondary users such as suppliers of goods and services do, however, depend upon these uses for part of their livelihood. When the analysis shifts to a comparison of the community dependence on the various resources, this distinction ceases to exist. See Summary Tables indicating District total personal income flows by industrial sector and its relationship to national resource lands.

## (2) Social-Economic

### (a) Economic Considerations of Oil and Gas Geothermal Resource Development

Although we have seen how money flows affect the relationship between industrial sources in a fairly static environment, there are change agents at work that can have potential impact on income distribution within the Elko District. The primary change agent we will address ourselves to is the potential of geothermal energy development within District Statistical Region. This statement makes the assumption

that the economic impacts from oil and gas leasing will be similar to geothermal leasing in regards to income flows; taxation policies by county governments and land value changes.

When viewing economic implications of geothermal development, several aspects must be taken into consideration: (1) Direct Revenues accruing from leasing activities, (2) Indirect Revenues from taxation, (3) Direct Expenditures, and (4) Indirect Expenditures.

### (i) Revenues

#### Direct Revenues

Income in the form of monies derived from geothermal lease rentals and royalties are distributed as follows: 95% to the U.S. Bureau of Reclamation and 5% to the State of Nevada. As regards to rentals, each lease brings in $1 to $2 per acre per year annual rental (minimum), which increases on a graduated basis after the fifth year. Advance rentals filed during the first three months of filing in Nevada totaled 1.7 million dollars.

Revenue obtained from oil and gas leases is broken down in the following manner:

52 1/2% to U.S. Bureau of Reclamation
37 1/2% to State of Nevada
10% to U.S. Treasury.

At the present time, 2,700,000 acres are under lease in Nevada. These oil and gas leases will yield about 1/2 million dollars to the state per year. In addition, in 1964, counties in the state received $230,000 from taxes on leases held.

Royalties. When production is reached, royalties up to 10-15% of the value of the steam are assessed. Royalties up to 5% are also paid on by-product minerals, including commercial demineralized water. This latter implication can be important due to the fact that highly-mineralized geothermal water has

been found in the District. (Primarily in the Crescent Valley area), an example of how royalties providing income can be seen at the Geysers area in Sonoma County in California: a royalty of 10% of the steam value is paid to private landowners. The royalty averages about $250,000 per year per 100 MW plant. With a 400 MW capacity, the royalty is about 1 million dollars per year from a production area about two miles wide by seven miles long.

On competitive lease sales, bonus bids are an additional source of revenue. Using the California example again, the first Federal lease sale held on January 22, 1974, twenty leasing units were bid on with 57 bids totaling $12.5 million. The highest bid for a single leasing unit was $3.2 million which amounts to $1,367.50 per acre for the 2,340 acre unit.

Non-competitive oil and gas leases are issued for a period of 10 years at a rental of 50¢ per acre per year. If oil is discovered, a royalty of 12 1/2% is collected on all production.

All oil and gas leases, prior to commencement of drilling operations, are subject to a bond of $10,000.00 per lease, a statewide bond of $25,000.00 or a nationwide bond of $150,000.00.

## Indirect Revenues

Taxation by state and local subdivisions accounts for an additional increment of revenue. Taxes paid to Sonoma County from the Geysers approximate $1 million per year for the current 400 MW capacity. However, as of this writing, Elko, Eureka and Lander Counties have no taxation policy concerning competitive leases for geothermal development. Elko County does have on the books, policy on taxation of oil and gas leases, but litigation currently in the courts has precluded payment to respective counties involved in leasing programs. Needless to say, income via taxes paid to respective counties can have significant positive impact on county

finances, e.g. although the Federal government does not pay property tax, persons who hold leases to government lands are subject to taxation of the possessory interest value of that lease which may be determined by open competitive bidding. Thus, this price would probably establish a firm basis for possessory interest assessment, and tax revenue to the county from geothermal development will, therefore, be the same regardless of ownership. Continuing with our California example . . . for Fiscal Year 1973-74, the geothermal development at the Geysers will provide about \$2,500 per megawatt of power production capacity as annual revenue to Sonoma County. Development on government lands may be expected to be similar and hence yield comparable revenues for areas developed. At present, natural resource lands are yielding little direct tax revenue to the counties. Another example of indirect revenue is the aspect of increasing land values to any adjacent private tracts of land bordering an oil and gas or geothermal development area. These potential revenues affect: (1) counties, i.e. additional taxes brought about by private land value changes, and (2) potential capital gains to the landowner in the form of revenue gained upon sale.

## (ii) Expenditures

### Direct Expenditures

Due to the high cost of oil and gas, geothermal exploration and development, these expenditures must be absorbed by the lessee. Examples of these costs are: (1) Development of a 110 MW plant costs \$15-17.5 million at the Geysers. (2) Individual wells cost about \$150,000-\$200,000 each. Individual community finances will be little affected by these capital intensive activities in the exploratory phases of development.

### Indirect Expenditures

In a previous discussion, it was stated that oil and gas, geothermal development was classified as

a change agent affecting "change" in existing income, origins, and distributions ----- at this time, it is necessary to discuss another aspect energy exploration impact has on the community, and that is the demand for community services needed by the lessee, especially in the development and operation phases.

During exploration drilling, two drilling rigs might be used for 1-2 years by one company. Employees would consist of about 40 people directly involved in drilling, with 10-20 additional service people intermittently involved. Development would advance in 55-110 MW increments in an orderly fashion over a period of 2-10 years. Drill crews for 2-3 rigs would number 40-60 and 20-30 additional people would be involved in plant construction. All of the above personnel would be temporary.

Once the field is operating on stream, about five (5) permanent employees are needed for field production, plus five (5) more for each 110 MW plant. One drilling rig would be needed full time, adding 20 more permanent employees to the area.

Thus, for several years, a local community would be burdened with providing necessary school and service facilities for between 40 and 90 additional temporary families. Thereafter, 30 or more families would become permanent residents, also requiring services. See attached overlays illustrating the relationship between current oil and gas, geothermal lease areas and population distributions in those areas. (Figures 1 and 2.) The above may vary greatly dependent upon numbers of active operators and significance of discoveries.

In the short run, communities near a geothermal development would be financially strained. However, such development is capital intensive and in a few years, the increased tax base should be much greater than community expenditure on a per capita basis of additional residents.

It can be said that in most cases, the energy source tapped by oil and gas or geothermal development is not otherwise used. Most lands in a KGRA potentially

subject to Federal geothermal lease have present surface uses which have less economic value than geothermal power. Geothermal development, therefore, would increase the productivity of the region and the nation by either making use of previously-unemployed resources, or employing resources in a more valuable way.

It is entirely possible that some current uses of these lands will be only slightly diminished by geothermal leasing. Other uses may be enhanced. Thus, it appears that geothermal leasing would contribute to both the short-term and long-term productivity of some of the natural resource lands.

### (3) Some Concluding Comments Concerning the Economics of Geothermal Development

As of this writing (August 19, 1974), there has been found no "clean" vapor-dominated geothermal corrective system within the Elko District. This effectively, for the time being, precludes cost, benefit comparisons with the Geysers field in California, *however*, advancements in technology using large volumes of hot water, "dirty" steam, and so forth, will bring about the development of presently dormant geographic regions during the next decades. In addition, geothermal fluids are considered to be a brand new water, a raw material (most significant in the arid American West and desert regions of the world).

In a purely economic view, it can be said that the feasibility of a geothermal field is the function of its steam capacity, the output and spacing of individual wells, power demand, and delay time. The optimum size of power plants (in a non-atomic explosive fractured area), is 55 megawatts. The geometry of spacing wells and pipelines to the plant limits the profitability of size. Therefore, the interrelationship between the geothermal area, pipeline and power plant is to be considered.

The main arguments in the economics of geothermal power production lie in the cost comparisons with different power plants. As seen by Table 15 [Costs of Operating Power Plants by Type of Plant], it is evident that geothermal power production has the least cost among known

Table 15 & 16

## ILLUSTRATIONS OF LEAST COST AND EFFICIENCES OF GEOTHERMAL ENERGY PRODUCTION

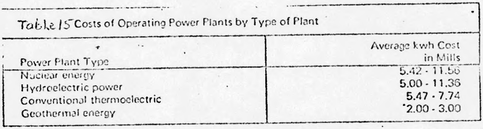


Table 15 Costs of Operating Power Plants by Type of Plant

| Power Plant Type | Average kwh Cost in Mills |
|---|---|
| Nuclear energy | 5.42 - 11.56 |
| Hydroelectric power | 5.00 - 11.36 |
| Conventional thermoelectric | 5.47 - 7.74 |
| Geothermal energy | 2.00 - 3.00 |

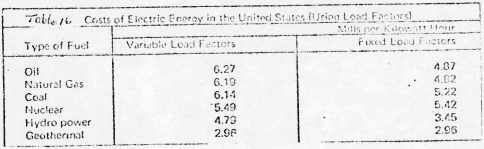


Table 16 Costs of Electric Energy in the United States (Using Load Factors)

| | Mills per Kilowatt Hour | |
|---|---|---|
| Type of Fuel | Variable Load Factors | Fixed Load Factors |
| Oil | 6.27 | 4.87 |
| Natural Gas | 6.19 | 4.82 |
| Coal | 6.14 | 5.22 |
| Nuclear | 5.49 | 5.42 |
| Hydro power | 4.79 | 3.45 |
| Geothermal | 2.96 | 2.96 |

SOURCE: ATLANTA ECONOMIC REVIEW, GEOTHERMAL ENERGY, ITS FUTURE AND ECONOMICS; DECEMBER 1971.

power plant types. Another indication is the fact that geothermal plants operate at higher load factors, thus lower costs, than do any other power plants as Table 16 illustrates.

Although geothermal development has been proven economical under set conditions (see preceding narrative), it is at the present time a long-range potential as regards to producing income to local communities. In regards to future development, the fledging geothermal energy industry is a capital intensive one requiring little immediate services from the communities within the District, however, this situation is subject to change in ratio to the quality of the exploratory and development phase experienced by the geothermal industry. The priority of such development can be seen by recent congressional actions, e.g. The Geothermal Energy Research, Development and Demonstration Act of 1974, which approved 404 to three authorizing spending $50 million yearly to prove by 1980 that the geothermal process is feasible for obtaining some of the nation's energy. This Act has already been implemented in northwestern Nevada where the Atomic Energy Commission has requested a temporary withdrawal of 86,000 acres of natural resource lands. It is expected that 5,000 acres of these lands will be identified for long-term retention and use in the development of a demonstration geothermal power generating facility. In this instance, the AEC is seeking a suitable low salinity geothermal water reservoir to be used as the heat source for a pilot generating plant with a 10 megawatt capacity.

If current interest in geothermal power continues, fueled by advances in technology that can alter the whole economics of geothermal power production, e.g. the Plowshare geothermal power generation; the Magmax process, and other freon-gas processes --- then, it can be expected that positive net economic changes to the District's income base will occur. If current demands for power continue as projected (see projected electric energy growth patterns for Nevada and its portions of Federal Power Commission's power supply areas (PSA's) --- specifically PSA 41 Elko County) then, it can also be expected that at least a certain percentage of that demand will be met by geothermal energy.

### d. Attitudes and Expectations

Since no direct inquiry of the citizenry of the District has taken place, we can only assume some logical sequential expectations: As a general feeling, these would probably be no adverse effect in the community to oil and gas or geothermal development. In this regard, the community would welcome any type of development that would be beneficial to the area, e.g. the initial stages of oil and gas or geothermal development providing employment and wages would be a good example of positive benefit to the communities within the District. A short-term negative impact would, of course, be the impact of development on community services. This negative impact would nullify itself as time provided additional revenues to county finances in the form of the increased tax base. Mr. Boies, County Commissioner, commented that development would have favorable impact on county economics.

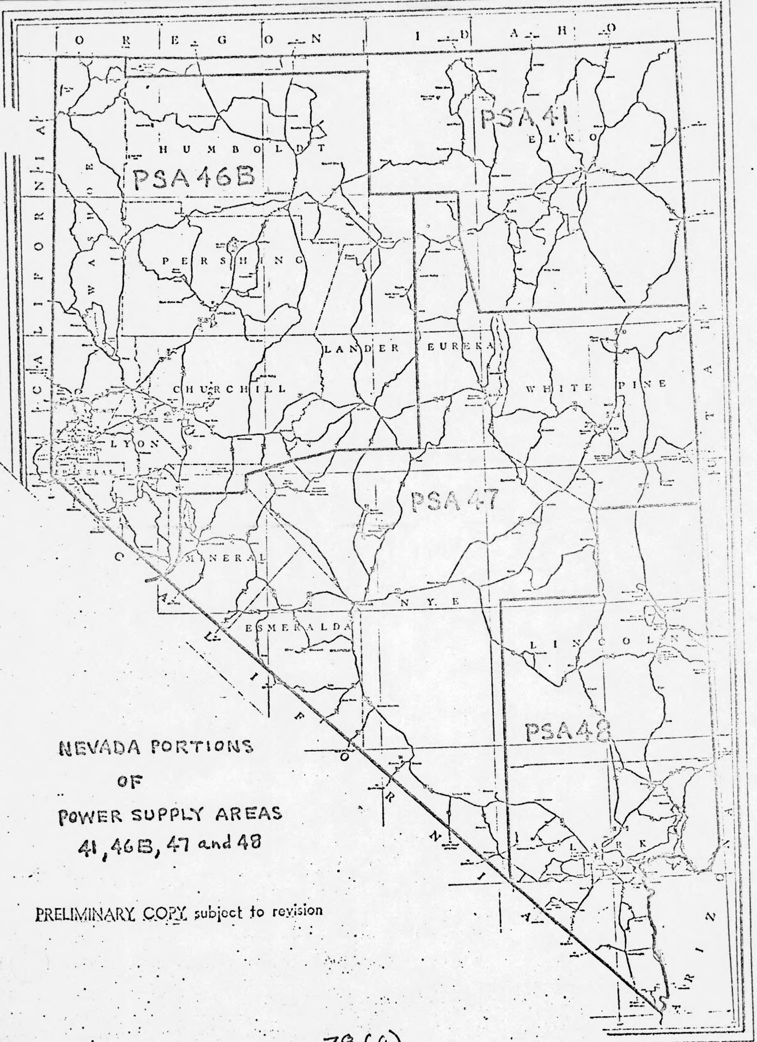
### e. Local Regulatory Structure

Elko County is governed by a County Manager, a Board of Commissioners, a County Planning Commission, whereas Lander and Eureka Counties both have county commissioner forms of government. Eureka County lacks both zoning and planning status at this time. Lander County is under a General Plan as established in 1969 and a Zoning Plan initiated in 1968. Elko County in 1968 adopted "Open Space" or "OS" Zoning which is intended to provide protection to agricultural areas from urban development or residential subdivisions, and to serve as open space area around the more intensive urban uses of the county.

Values recognized should be protected in the Ruby Mountains scenic area, Pearl Peak Bristlecone area, Jarbidge wilderness, Jarbidge, Bruneau and South Fork of Owyhee River wild or scenic and primitive areas, the many other areas currently receiving heavy recreational use, Ruby Lake Wildlife Refuge, and the many other areas currently being considered for their primitive, ecological or potential recreational uses.

### f. Hazards to Human and Animal Health

There are many natural hazards or potentially hazard situations within the subject area. Examples are the scalding hot water



NEVADA PORTIONS
OF
POWER SUPPLY AREAS
41, 46B, 47 and 48

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| ELECT ENERGY HISTO: GROWTH PATTERNS FOR NEVADA | | GWH For Resid. | GWH For Comm. | GWH For Indust. | GW For A.. Others | GWH Total Classif. Sales | GWH Losses | GWH Total Energy Req'd |
|---|---|---|---|---|---|---|---|---|
| PSA 41 | 1950 | 4.3 | 5.6 | .1 | 2.6 | 12.6 | 1.3 | 13.9 |
| | 55 | 7.5 | 9.2 | .3 | 3.4 | 20.4 | 1.4 | 21.7 |
| | 60 | 11.0 | 13.4 | .4 | 3.1 | 27.9 | 2.2 | 30.1 |
| | 65 | 17.7 | 22.5 | 8.8 | 4.1 | 53.1 | 4.2 | 57.3 |
| | 1970 | 25.8 | 34.2 | 9.6 | 4.5 | 74.2 | 7.0 | 81.2 |
| PSA 46B | 1950 | 72.1 | 68.4 | 34.5 | 4.0 | 179 | 40.0 | 219 |
| | 55 | 127 | 119 | 92.3 | 5.2 | 343 | 51.4 | 395 |
| | 60 | 206 | 220 | 90.0 | 11.3 | 527 | 78.8 | 606 |
| | 65 | 315 | 380 | 193 | 17.1 | 905 | 137 | 1042 |
| | 1970 | 451 | 585 | 368 | 29.5 | 1434 | 171 | 1605 |
| PSA 47 | 1950 | 6.7 | 3.5 | 9.8 | 2.2 | 22.3 | 1.1 | 23.4 |
| | 55 | 8.9 | 6.8 | 18.0 | 14.8 | 48.4 | 3.4 | 51.8 |
| | 60 | 12.1 | 10.5 | 19.9 | 1.6 | 44.0 | 3.4 | 47.5 |
| | 65 | 18.2 | 19.2 | 26.1 | 2.7 | 66.2 | 5.5 | 71.7 |
| | 1970 | 25.8 | 37.2 | 31.1 | 2.9 | 97.0 | 10.6 | 108 |
| PSA 48 | 1950 | 111 | 67.5 | 293 | 35.6 | 506 | 30.9 | 537 |
| | 55 | 260 | 187 | 610 | 30.1 | 1087 | 62.3 | 1149 |
| | 60 | 388 | 347 | 708 | 32.7 | 1476 | 58.6 | 1534 |
| | 65 | 908 | 704 | 798 | 57.6 | 2468 | 199 | 2666 |
| | 1970 | 1416 | 1218 | 1024 | 143 | 3801 | 242 | 4044 |
| Nevada | 1950 | 194 | 145 | 337 | 44.4 | 720 | 73.3 | 793 |
| | 55 | 404 | 322 | 720 | 53.4 | 1499 | 118 | 1618 |
| | 60 | 617 | 590 | 818 | 48.6 | 2075 | 143 | 2218 |
| | 65 | 1259 | 1126 | 1025 | 81.5 | 3492 | 346 | 3838 |
| | 1970 | 1919 | 1875 | 1433 | 180 | 5406 | 431 | 5838 |

GWH
= giga watt h
= 1,000 megawa

| ELECTRI NERGY PROJECTED GROWTH PATTERNS FOR NEVADA | | GWH For Resid. | GWH For Comm. | GWH For Indust. | GWH For All Others | WH Total Classif. Sales | GWH Losses | GWH Total Energy Req'd |
|---|---|---|---|---|---|---|---|---|
| PSA 41 | 1980 | 60.2 | 87.0 | 17.0 | 5.4 | 170 | 16.1 | 186 |
| | 90 | 108 | 155 | 27.0 | 6.5 | 297 | 28.2 | 325 |
| | 2000 | 154 | 219 | 40.0 | 7.7 | 421 | 40.0 | 461 |
| | 10 | 192 | 266 | 56.0 | 8.8 | 523 | 49.7 | 573 |
| | 20 | 220 | 292 | 74.0 | 9.8 | 596 | 56.6 | 652 |
| PSA 46B | 1980 | 885 | 1207 | 844 | 60.0 | 2996 | 345 | 3341 |
| | 90 | 1493 | 2066 | 1500 | 103 | 5162 | 594 | 5756 |
| | 2000 | 2172 | 3088 | 2230 | 153 | 7643 | 879 | 8522 |
| | 10 | 2721 | 3911 | 2930 | 195 | 9757 | 1122 | 10879 |
| | 20 | 3145 | 4480 | 3500 | 227 | 11352 | 1305 | 12657 |
| PSA 47 | 1980 | 44.7 | 70.4 | 47.3 | 3.5 | 166 | 18.3 | 184 |
| | 90 | 68.6 | 113 | 68.0 | 4.1 | 254 | 28.0 | 282 |
| | 2000 | 94.9 | 154 | 92.2 | 4.7 | 346 | 38.0 | 384 |
| | 10 | 118 | 192 | 120 | 5.3 | 435 | 47.9 | 483 |
| | 20 | 136 | 220 | 143 | 6.0 | 505 | 55.6 | 561 |
| PSA 48 | 1980 | 2996 | 3165 | 1570 | 232 | 7963 | 637 | 8600 |
| | 90 | 5501 | 6651 | 2350 | 349 | 14851 | 1188 | 16039 |
| | 2000 | 8127 | 10795 | 3320 | 485 | 22727 | 1818 | 24545 |
| | 10 | 10768 | 14931 | 4430 | 622 | 30751 | 2460 | 33211 |
| | 20 | 13080 | 17211 | 5700 | 750 | 36741 | 2939 | 39680 |
| Nevada | 1980 | 3986 | 4529 | 2478 | 301 | 11295 | 1016 | 12311 |
| | 90 | 7171 | 8985 | 3945 | 463 | 20564 | 1838 | 22402 |
| | 2000 | 10548 | 14256 | 5682 | 650 | 31137 | 2775 | 33912 |
| | 10 | 13799 | 19300 | 7536 | 831 | 41466 | 3680 | 45146 |
| | 20 | 16581 | 22203 | 9417 | 993 | 49194 | 4356 | 53550 |

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| ELEC. ENE 1<br>HISTORIC GROWTH PATTERNS FOR NEVADA | | MWH For Resid. | Number of Resid. | MWH Per Resid. | MWH For Comm. | Number of Comm. | MWH Per Comm. | MWH For Indust. | MWH For All Other | MWH Total Classif. Sales | MWH Losses | N.I. Energy Require. | KW Ann. Peak Demand |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PSA41 | 1950 | 4258 | 2648 | 1.61 | 5646 | 884 | 6.39 | 122 | 2588 | 12614 | 1288 | 13902 | 3422 |
| | 55 | 7478 | 3186 | 2.35 | 9238 | 831 | 11.12 | 269 | 3384 | 20369 | 1351 | 21720 | 4804 |
| | 60 | 11042 | 3796 | 2.91 | 13395 | 844 | 15.87 | 365 | 3088 | 27890 | 2223 | 30113 | 6848 |
| | 65 | 17749 | 4515 | 3.93 | 22495 | 1008 | 22.32 | 8806 | 4087 | 53137 | 4186 | 57323 | 10430 |
| | 1970 | 25842 | 5386 | 4.80 | 34249 | 1087 | 31.54 | 9582 | 4519 | 74192 | 7022 | 81214 | 14857 |
| PSA 46B | 1950 | 72076 | 19124 | 3.65 | 68378 | 3661 | 18.68 | 34450 | 3968 | 178872 | 40000 | 218872 | 47896 |
| | 55 | 127128 | 25628 | 4.96 | 118780 | 4638 | 25.61 | 92336 | 5157 | 343401 | 51388 | 394789 | 82249 |
| | 60 | 205544 | 34801 | 5.91 | 220004 | 6291 | 34.97 | 89971 | 11281 | 526800 | 78840 | 605640 | 116241 |
| | 65 | 314589 | 48228 | 6.52 | 380360 | 8581 | 44.33 | 192993 | 17117 | 905059 | 137334 | 1042393 | 199128 |
| | 1970 | 450968 | 59882 | 7.53 | 585391 | 11137 | 52.56 | 367949 | 29535 | 1433843 | 171207 | 1605050 | 275610 |
| PSA 47 | 1950 | 6734 | 4094 | 1.64 | 3529 | 666 | 5.30 | 9773 | 2225 | 22261 | 1123 | 23384 | 6894 |
| | 55 | 8925 | 4798 | 1.86 | 6775 | 832 | 8.14 | 17965 | 14778 | 48443 | 3404 | 51847 | 11743 |
| | 60 | 12085 | 4555 | 2.65 | 10508 | 1195 | 8.79 | 19864 | 1591 | 44048 | 3424 | 47472 | 13057 |
| | 65 | 18213 | 5483 | 3.32 | 19223 | 1187 | 16.19 | 26125 | 2667 | 66228 | 5480 | 71708 | 14458 |
| | 1970 | 25805 | 5900 | 4.37 | 37162 | 1364 | 27.24 | 31115 | 2908 | 96988 | 10609 | 107597 | 19287 |
| PSA 48 | 1950 | 110525 | 12844 | 8.61 | 67454 | 3226 | 20.91 | 292669 | 35617 | 506265 | 30898 | 537163 | 119915 |
| | 55 | 260072 | 25601 | 10.16 | 187277 | 7108 | 26.35 | 609632 | 30058 | 1087039 | 62258 | 1149297 | 23271 |
| | 60 | 388342 | 31170 | 12.46 | 346563 | 7974 | 43.46 | 708285 | 32654 | 1475844 | 58605 | 1534449 | 31946 |
| | 65 | 908013 | 66709 | 13.61 | 704352 | 11413 | 61.71 | 797540 | 57645 | 2467550 | 198735 | 2666285 | 5253 |
| | 1970 | 1416319 | 86683 | 16.34 | 1218240 | 12926 | 94.25 | 1023533 | 143365 | 3801457 | 242235 | 4043692 | 79439 |
| Nevada | 1950 | 193593 | 39310 | 4.92 | 145007 | 8437 | 17.19 | 337014 | 44398 | 720012 | 73309 | 793321 | 17549 |
| (Coincident | 55 | 403603 | 59213 | 6.82 | 322070 | 13409 | 24.02 | 720202 | 53377 | 1499252 | 118401 | 1617653 | 32318 |
| Demand*) | 60 | 617013 | 74322 | [illegible] | 590470 | 16304 | 36.22 | 818485 | 48614 | 2074582 | 143092 | 2217674 | 45561 |
| | 65 | 1258524 | 124935 | 10.07 | 1126430 | 22189 | 50.77 | 1025464 | 81516 | 3491974 | 345735 | 3837709 | 74951 |
| | 1970 | 1918932 | 157831 | 12.16 | 1875042 | 26514 | 70.72 | 1432179 | 180327 | 5406480 | 431073 | 5837553 | 10630 |
| | | | | | | | | | | | | | * |

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PSA 41 and 47 Together

Reciprocal

| | $\Sigma$ Population | $\Sigma$ MWH | MWH Percapita | % of State Population | Recip MWH PerCap. | Recip. Pop. x$10^6$ |
|---|---|---|---|---|---|---|
| 1950 | 31374 | 37286 | 1.19 | 19.6 | .840 | 31.9 |
| 1955 | 32720 | 73567 | 2.25 | 15.3 | .444 | 30.6" |
| 1960 | 34324 | 77585 | 2.26 | 12.0 | .442 | 29.1 |
| 1965 | 36330 | 129031 | 3.55 | 9.7 | .282 | 27.5 |
| 1970 | 38871 | 188811 | 4.86 | 8.0 | .206 | .25.7 |
| 1980 | | | | | | |
| 1990 | | | | | | |
| 2000 | | | | | | |
| 2010 | | | | | | |
| 2020 | 70825 | | | | | 14.1 |

Hookups for Residences

| | PSA41 Resid. | PSA 47 Resid. | $\Sigma$ Hkps Resid. | $\Sigma$ Res. MWH | MWH Per Resid | PSA41 Res. MWH | PSA47 Res MWH |
|---|---|---|---|---|---|---|---|
| 1950 | 2648 + | 4094 = | 6742 | 10992 | 1.6304 | 4258 | 6734 |
| 1955 | 3186 | 4798 | 7984 | 16403 | 2.0545 | 7478 | 8925 |
| 1960 | 3796 | 4555 | 8351 | 23127 | 2.7694 | 11042 | 12085 |
| 1965 | 4515 | 5483 | 9998 | 35962 | 3.5969 | 17749 | 18213 |
| 1970 | 5386 | 5900 | 11286 | 51647 | 4.5762 | 25842 | 25805 |

$$= \frac{\Sigma \text{Res. MWH}}{\Sigma \text{Hkps. Resid.}}$$

78(c)

6.

within the KGRAs or the thin crust near mud pots. These are generally known to the local population and animals have some natural instinct to avoid the danger areas.

There are several old mine shafts throughout much of the subject area. These can pose serious danger to the irresponsible individuals who venture where common sense argues not to go. Other dangers are indiscriminate disposal of waste, flash-floods, washouts, and heavy traffic on back roads.

There are two watersheds on USFS lands that have been closed to all surface uses. These are the Bear Creek watershed serving Jarbidge and the Brown's Gulch watershed for Mountain City.

## III. ANALYSIS OF THE PROPOSED ACTION AND ALTERNATIVES:

The analysis to follow will deal, in turn, with the proposed action - allow oil and gas or geothermal exploration, development and operation governed by the USDI General Stipulations; and special stipulations for resource protection in the subject area and each alternative: (1) Allow oil and gas or geothermal resource action governed only by the USDI General Stipulations, (2) Decline lease action, and (3) Postpone leasing pending further study of the subject area and impacts - as they affect the environmental setting and develop recommendation for the diminution or mitigation of the anticipated impacts.

The recommendations herein developed are to be incorporated within subsequent leases and will be the enforcement responsibility of the surface land management agencies.

The elements of this analysis are: A. The Anticipated Impacts - Given actions may produce certain consequences (impacts); B. Possible Mitigating or Enhancement Measures - What preventive improvement or rehabilitation actions can be taken to offset the consequences; C. Residual Impacts - Upon application of the mitigating measures, what is the significance of remaining impacts; D. The Relationship of Short-Term Use to Long-Term Productivity of the affected lands; and E. Irretrievable and Irreversible Commitments of the Resource - Will the consequence of allowing development permanently commit or produce changes in the environment.

For the purpose of this analysis, the preceding Environmental Checklist was developed and used as a guide:

### (I) The Environmental Impacts of the Proposed Action

#### A. Anticipated Impacts

Both oil and gas and geothermal development are closely related and shall be considered simultaneously herein. Refer to the attached Technical Report.

The extent of the environmental impacts can only be assumed as the extent of oil and gas deposits or geothermal steam resource, if present, is unpredictable. In the discussion of environmental impacts, it is assumed that any production areas would be similar in size to the Eagle Springs Oil Field or the Geysers Geothermal Field. Immediate impacts are associated with limited exploration by drilling, while long-term impacts are associated with development of an oil field or geothermal resources.

In general, the aerial survey portion of this step will have very little, if in fact any, impact upon the environment. This stage will not be further considered because of the insignificant impacts.

### 1. Non-Living Environment

#### a. Air

There are primarily three forms of air pollution associated with exploratory work in the leasing program. These are particulate matter, gases and vapors. With oil and gas exploration, the latter is of less consequence.

(1) *Particulate matter* (dust) will result from off-road vehicle use, road and trail construction and drill pad construction. During the exploration stage, the impact will be more localized, but of greater impact because of the vast amount of construction taking place upon the field. Geothermal sites will have the increased construction for cooling towers, power plants powerlines and evaporator ponds. With operation and close-out, the impact will be diminished. The foregoing impacts are variable dependent upon location. Generally, desert valley soils tend to become dust with road use during summer months and, therefore, would produce higher localized particulate pollution. This will not be a long-term impact.

(2) *Gases and Vapors* - Impacts from geothermal steam gases or vapors will be primarily from drilling. Properly executed drilling procedures will eliminate or minimize the possibility of escaped gases from test wells. Engine emissions will be minor and of no consequence when compared to all other air pollutant factors.

Vapors produced during the exploration and development stage may or may not be harmful. The consequence is governed by the types of mineralization within the given area. For a discussion of toxicity levels see *Final Environmental Statement* for the *Geothermal Leasing Program*, U.S. Department of the Interior, Volume 1, Page III-14, (1973).

An analysis of steam produced at Beowawe is given in, "The Chemical Composition and Estimated Minimum Thermal Reservoir Temperatures of the Principal Hot Springs of

Northern and Central Nevada," USGS, 1974, (refer to Page 20(c)). Data for the Hot Springs Point, Elko Hot Springs and Sulphur Springs were not available. All springs in the KGRAs emit some gases and there is a slight hydrogen sulfide odor associated with these waters.

The most significant production of vapors would occur through venting during drilling and subsequent testing, or accidental occurrences. This would be a short-term effect and probably produce gases in quantities below toxic levels that would not have a significant impact upon the environment. Upon close-out, only natural venting in geothermal areas will remain.

(3) Noise and vibration levels during construction would destroy the isolation and silence presently experienced in the area. Operation of heavy equipment, unmuffled trucks, drill rigs and pumping units constitutes a noise source in both exploration and the producing oil field. Considerable human and vehicular activity would also raise noise levels above that presently experienced.

Venting to determine the flow characteristics of the geothermal well would create high noise levels within localized areas for a short period of time during all stages. Upon close-out, the area would return to a natural setting.

b. Lands

Soils vary from site to site depending upon many factors. Principles are type of soil, topography and climate.

(1) Soil Erosion - Impacts from exploration will be based on the degree of surface disturbance. Road and trail construction, well drilling and vehicle use may alter soil depth and structure. "Scalping" of drill pad sites and soil compaction will be the main causes of soil erosion. Excessive damage occurs if off-road vehicle use occurs during high soil moisture periods.

The impacts would range from low in off-road vehicle travel to high in scalping and site construction activity. Areas having particular high erosion hazards

are the silty and saline valley soils and steep mountain slopes.

The removal of soil and the disturbance of the surface would result chiefly from construction activities associated with development and operation. It has been estimated from actual measurements taken of roads, pipelines and well sites that a maximum of 25% of the ground surface may be disturbed within the area occupied by a fully-developed oil field. The impact would involve the complete removal of protective vegetative cover and topsoil, exposing the sterile subsoil. Extensive rapid erosion occurs on steep cut and fill slopes composed of unconsolidated materials devoid of protective cover. The erosion process could be greatly accelerated by all types of surface disturbance within a critical erosion area.

The impacts associated with geothermal steam development and operation are similar. In addition, other impacts are:

(a) Water disposal into evaporation ponds will require soil excavation. This activity will alter soil structure and depth but will cause no erosion. Reinjection of waste water will be dependent upon the geologic characteristics of the geothermal field.

(b) Power plant, cooling towers, disposal pipeline and power transmission lines will necessitate additional construction.

At the end of production, the equipment used to remove surface improvements will undoubtedly cause surface disturbance. Again, as in the construction phase, slight effects on soil depth and structure will result in some erosion. Surface restoration may also cause temporary soil impacts.

(2) Soil nutrients would be lost from areas cleared for drill pads, sumps and roads. Without replacement of the top soil, this could be a significant impact upon site productivity for a long-term period.

During the development and operational stages, more extensive disturbance will occur and will have more significant impacts than the previous stage.

With close-out, the soils will be only partially restored because much would be used in compacted fill under development.

(3) During the exploration stage, the potential for pollution of the soil is generally low. Minor amounts of soil pollutants could be released into the environment by off-road vehicles or spilled from heavy machinery during the construction of roads, trails and drill pads. Sterile drill cuttings, drilling mud and chemicals would be spread upon small plots adjacent to the drill sites, or buried upon abandonment of mud pits at the drilling sites.

During the development operational stage, toxic substances could be spilled creating an impact. Oil spills of various sizes are common to oil field operations. These result from broken pipelines, blown boxes at the well heads, breached reserve and sump pits, trucks, servicing of wells, equipment failure and human error. Crude oil destroys vegetation and sterilizes the soil for long periods of time. With an unchecked well blowout, toxic drilling fluids could be blown over the surrounding country-side near the well. This would have an adverse impact upon the soil for some time.

During the close-out, there is little chance of adverse impact other than those described for the exploration stage.

(4) Geologic structure alterations, as a result of exploratory drilling, could cause minor impacts beneath the ground (e.g., lost circulation and possible contamination of ground water aquifers).

Because geothermal areas are typically associated with seismic activity, there has been some concern about reinjecting spent thermal fluids into the reservoir and triggering adverse seismic activity. According to Bowen in Kruger and Otte (1973, pg. 205), "...geothermal reservoirs are at subnormal pressures and the return of fluids merely maintains preexisting pressures in the reservoir and would not cause the increasing seismicity noted in other conditions (i.e., oi and gas reservoirs)."

There will be no impact associated with the close-out stage.

(5) Land use compatability and suitability is highly varied. With the exception of the playas and adjacent dune areas, any entrance of wheeled or tracked vehicles upon the lands will leave marks visible for many years. Roads and drill pads bull-dozed upon steep hillsides cannot be restored to any semblance of their original condition and may lead to rapid erosion. The scars of past and present mining are plainly visible in many areas. Natural revegetation tends to be extremely slow, and the initial flora established usually are undesirable species such as (halogeton, Russian thistle, etc.) or less desirable species (cheatgrass). On some roads and old exploratory trails, the native vegetation has not been restored during the30 years period following abandonment.

The 1872 mining law does not require minimization of impacts nor rehabilitation of lands following the many phases of mining. These become permanent blemishes upon the landscape for generations to come. In comparison, both the oil and gas and geothermal leasing programs offer the opportunity for land management agencies to develop environmental stipulations to eliminate land use conflicts and minimize the impacts of exploration and development.

In general, the lands are suitable for mineral exploration, but uses are not compatible with methods commonly employed in the past. With adequate controls on surface use, combined with well-developed and strictly applied surface protection stipulations, exploration, development and production of oil and gas or geothermal resources could be compatible with the multiple-use mix on most areas. Only on special use, frail land or frail environmental areas, would a conflict of use suitability and compatability become a limiting factor. Examples are primitive areas, wildlife refuges, recreation sites, unique ecosystems and areas necessary to the life and reproduction of certain wildlife species.

c. Water

(1) The hydrologic cycle of the many springs, ponds, reservoirs, streams and groundwater areas are not expected to be adversely impacted under normal exploratory stage of the leasing program. Generally, possible impacts are considered as low. With exploratory drilling and subsequent development and operation in the vicinity of streams, springs, reservoirs and marsh lands, adverse impacts could be very significant.

Drilling could adversely impact springs by causing a drop in the water table impacting surface flow, dependent life forms and domestic livestock.

Water supplies can be lost or reduced during exploration. Seismic testing, stratigraphic testing and wildcat drilling can alter the groundwater hydrology by fracturing impermeable zones below aquifers, permitting them to be lost or reduced through vertical drainage. The probability of this happening is fortunately low.

Reduction of the groundwater supply might occur as a result of development and production. If the oil or geothermal field is large enough to cause significant water reduction, the result might reduce the livestock and wildlife uses. The impact might displace families, livestock and wildlife.

With close-out, the affected water table may rise and be tapped for beneficial uses.

A benefit from the leasing program is the discovery of water-bearing strata for future development in providing water for use on water short areas.

(2) Sediment Load - During the exploration stage, there will be a chance of sediment increase from primarily road-blading and drill site preparation. The significance will depend upon amounts and location.

During the development and operation phase, there will be high amounts of disturbance within a relatively small area. This will have significant impacts especially if located where high runoff occurs or near streams, reservoirs, ponds, marshes and springs.

The sediment pollution will have further impacts of silting in shallow ponds, reservoirs, marshes and stream courses.

Heavy earth-moving equipment working on steep lands can gut watersheds and streams almost overnight.

Any change that tends to increase sediment may have great adverse impact upon the productivity of a stream system.

Stream quality is governed largely by watershed conditions. Land use may accelerate erosion to a point where pools are filled, food producing gravels covered with barren material, plant beds covered and destroyed and turbidity increased. The sediment deposition leads to an unstable stream course causing bank-cutting and channel erosion as a new level of equillibrium is sought.

Sedimentation has an adverse impact upon all forms of aquatic life. The results are abraded gill filaments of aquatic organisms, which along with lowered oxygen level could result in aquatic organism mortality.

An increase in turbidity of surface waters not only affects the scenic quality, but also contributes to lower dissolved oxygen levels. Dissolved oxygen is less soluable in warmer waters which results from increased turbidity.

(3) Dissolved Solids and Acid Balance - Exploratory drilling could yield large amounts of briny waters. Briny water production can contaminate surface waters if washed from evaporation ponds during flash-floods or dike failure resulting from poor construction in the vicinity of surface waters.

Basically, briny water pollution of aquatic ecosystem would raise the pH of these already alkaline waters (6.9 to 9.6). In the marsh and small reservoir areas, this could result in upsetting the osmosis regulatory mechanisms in the cells of all the aquatic organisms. The organisms would die by dehydration and dessication.

The aquifers could be polluted by these brines and the results could be degraded water quality to the degree that it would not be suitable for human and animal use and in extreme cases could even be toxic to plant life.

(4) Toxic Pollution - Highly toxic drilling fluid additives, such as caustic substances, could contaminate local ponds by washing down a natural drainage or be bound by soil particles and carried there by wind forces. This, if in enough quantity for a time period, could result in extinguishing life in the small ponds and would have some impact within streams and large reservoirs.

Oil spills are very detrimental to water quality and aquatic life forms. Sizeable oil spills eventually reach intermittent stream bottoms from which they may be carried by surface runoff into ponds, springs, or ditches thus affecting quality of water for all wildlife, perhaps causing them to migrate or die. Water pollution by petroleum products is a serious problem, since oil substances contain toxic components, and, in general, are stable compounds that can remain in an ecosystem for relatively a long period of time.

The closed basin areas are particularly impacted because there is no means of flushing the toxicants.

(5) Thermal Pollution - Temperature contamination of existing surface waters by hot waters produced during exploration development or production stages would have significant impact upon aquatic flora and fauna. Many of the aquatic plants and animals have restrictive temperature adaptation.

Discharge of hot or super heated waters into the natural surface waters could raise temperatures above tolerance levels of various species and result in their eradication. An example is most trout species have upper thermal limits of approximately 70 degrees F. locally. When waters exceed this temperature for extended periods of time, they must locate cool deep pools or die from thermal exposure.

(6) Solid debris can be a problem where in clearing brush for roads or drill pads, the waste is placed in or located so it can enter the surface waters during the next high runoff period. This impact would be most significant during the development stage when large areas are cleared. During the close-out stage, the impact would be at its lowest level.

(7) The nutrient cycle would be affected by the foregoing factors. Sediment would cover food producing areas, briny pollution could destroy productivity and thermal pollution could increase flora growth in cold water systems.

2. Living Components

a. Aquatic Vegetation

The significant impacts that may occur are the result of sedimentation, thermal pollution, chemical pollution and lowered water tables or spring yields. Should exploration, development or operational stages cause loss of surface water yield or lowered water table, the impact could be very high particularly in small marsh, stream or reservoir areas. The results could be a dramatic reduction, or the complete elimination of aquatic life.

The impacts related to sedimentation, thermal and chemical pollution have been discussed previously in the foregoing section. Additional impacts that might occur to the aquatic ecosystem as the result of oil spills are:

(1) Oil could kill emergent and shore vegetation, reducing grazing capacity of the area for all graziers.

(2) Soil pollution by oil spills being absorbed by or bound to soil particles and later blown or washed into the ponds and forming slicks harmful to aquatic life.

(3) Coating vegetation of the surrounding area in blowout or spill killing the vegetation, by reducing photosynthesis.

(4) Oil lowers water quality by:

    (a) Increasing turbidity of water.
    (b) Lowering dissolved oxygen levels by adding to biochemical oxygen demand and stopping photosynthesis.

Another impact from sedimentation of waters is the smothering of submergent and shoreline vegetation through deposition of sediments.

b. Aquatic Animals

The impacts to these animals have been previously discussed under the elements of water quality in the non-living environment section and the preceding paragraphs concerning aquatic vegetation.

Disturbance of animals is an impact that could occur were roads and drill sites located in close proximity to aquatic areas. This could result in the animals dependent upon those areas moving to other sites or cause crowding as many seek the more secluded areas. The impact could have an adverse effect upon species mating habits and cause a reduction in young animals during the disturbance period. This is a significant concern for the Ruby Lake Refuge which has a high percentage of canvasback duck nesting.

Impacts during development and operational stages will be localized and generally high on specific small areas. For this reason, the wet meadow sites, because of their limited occurrence and high value for wildlife habitat and livestock forage are very important.

There are a few small streams and springs within the closed basin and Salt Lake drainage area supporting native fish

species left over from the Pliestocene period. These aquatic areas and their fauna represent a delicate balance stabilized through time by evolution to a specific situation. Any disruption of this ecosystem either through addition of foreign components or the reduction or modification of the existing habitat factors very likely will severely affect the fauna of the spring and most likely destroy at least part of it. In general, these areas are located upon private lands and by location, offer little opportunity for protective management.

Other impacts associated with oil development and operation should spills occur are:

(1) Oil in the aquatic ecosystem would coat gill filaments of fish, resulting in suffocation and death of fish.

(2) Oil lowers dissolved oxygen levels to possible lethal levels for fish by increasing turbidity and BOD.

(3) Waterfowl would leave the pond due to polluted pond and food resources. If the oil slick were to occur while waterfowl were present, the natural insulation and buoyancy of their feathers would be rendered ineffective.

### c. Terrestrial Plants

Off-road vehicle travel would produce only minor impacts in localized areas for a short period of time through crushing small plants and shrubs. Natural recovery would occur within a period of less than 5 years depending upon climate and soils. Large shrubs and trees would have little chance of damage because to run over these would probably inflict damage to the vehicle or could cause a fire from vegetative debris buildup within the engine compartment. The other phases would produce localized impacts of significance affecting lower growth forms of vegetation and possibly large shrubs and trees.

The probable occurrence for oil and gas or geothermal resources generally are best in the valley or low hill terrain. Because of this, there is little chance that the tall shrub and tree areas will receive much impact.

The disturbance of the vegetative cover during the development and operational stage will have an adverse effect on livestock grazing and wildlife habitat. Upon small portions of the area where an oil field is developed, the area available for grazing may be reduced as much as 25% without rehabilitation and to a proportionately smaller degree as rehabilitation progresses.

Following close-out of each stage, the small shrub and other invader species will reestablish within a short period of time. These species (Halogeton, sagebrush, cheatgrass and weeds), will dominate the disturbed sites for long periods of time unless the natural process is interrupted through rehabilitation measures.

### d. Terrestrial Animals

Exploratory action involving the stream and meadowland areas would have a significant impact upon several animal species dependent upon the vast supply of forage and cover plants in these areas. These wildlife species would be forced to relocate or perish.

(1) Mammals - The impact to livestock during the exploration stage would have little significance. During the development and operation stage, relatively small areas would be affected and only those supporting a high density of grasses and forbs would be of significance.

The impact of all facets of the exploration phase on wild free-roaming horses should be minimal. Horses are found in the remote areas such as the mountain ranges and other relatively inaccessible places. Exploration is likely to be limited in these areas.

Even where exploration occurs in the same area occupied by horses, the horses will just move out of the proximate area until exploration is completed.

The continued presence of man and his activities associated with permanent oil or geothermal field development could affect wild horses in the following manner:

(a) Displace them from their range in any portion of the valley where an oil field is developed. This

might have the effect of pushing the horses into areas not previously occupied and combine bands.

(b) Domestication of wild horses due to their familiarity with man. This would be contrary to the wild, free-roaming concept of wild horse management.

It is generally thought by our District personnel that these impacts are not significant for the subject area. Our herds are just not so confined. There may be some danger that people from the energy fields would harass or capture the horses in violation of PL 92-195.

Deer and antelope would react to all phases of the oil or geothermal leasing in much the same manner as the wild horse. Once human activity became too great, they would seek secluded areas. The program would have little impact if confined to summer ranges. The significant impacts develop when an operating field develops on crucial winter ranges. (See Exhibit "A" for range areas.) The impact is more in the form of destroyed food and cover than in interference with the animals. Likewise, an operating field encompassing benchland meadow areas would have similar impacts of destroying food and cover.

The impact upon small animals would be profound where disturbance occurs within or adjacent to meadow areas. These sites are key habitat areas for the group and any large disturbance is significant. The impact would further affect all predaceous animals dependent upon the small animals of these areas.

(2) Birds - The sage grouse would be subject to serious impact as a result of large depletion of key habitat areas. These are the strutting grounds and the meadow areas. Destruction of a strutting area would have a significant impact upon the species mating habits. Similarly, high amounts of human activity within close proximity to these areas during the March-April breeding period would have an impact. (See Illustration XIV, page 41(a) - Grouse Strutting Grounds.) The sage grouse depends heavily upon lush forbs and insects during the spring and summer months. With significant disturbance of meadow areas, the results could be a reduction in chick survival within a given area which in turn would affect total population available for hunting. Game managers at the 8th Annual Western States Sage Grouse Workshop recommended that a two-mile radius buffer zone be maintained free of surface disturbance around the strutting grounds.

Raptor birds would be impacted as a result of habitat reduction for prey animals. This would be significant for the endangered prairie and peregrine falcons and the Southern bald eagle.

Human activity within close proximity of nesting areas (usually rough, rock cliff areas), for the golden eagle or other birds of prey is a significant impact. The eagle is particularly nervous when approached by man. This characteristic results in incubation failures and abandonment of the nest. Therefore, any long-term activity within one mile of the nesting sites from mid-February to mid-July will adversely affect eagle nesting success.

Increased activity in previously little used areas normally results in increased mortality for eagles and most other birds of prey as a result indiscriminate shootings.

Winter time activity in jackrabbit concentration areas, or destruction of the brood areas of rabbitbrush common to the valley bottoms in the southeast corner of the District will affect wintering jackrabbit populations and impact the eagles and other birds of prey dependent upon jackrabbits as a food source.

Electrical power lines could cause electrocution of large raptors where smaller voltage lines are used.

Small birds dependent upon meadow areas would be most susceptible to serious loss of habitat.

### 3. Ecological Interrelationships

Many of the significant interrelationships have been discussed in the three preceding subtopics of this section. The principal interrelationships are closely associated with aquatic and valley meadow environments and these are also the significant impact areas.

The elements of the interrelationships are succession, food chains and community relationships. To avoid repetition, these are summarized as any impact affecting each element of the environment produces a chain of impacts affecting each level of life within the given community. As a habitat area is destroyed, the dependent life forms are forced to move, adapt or perish. The evolutionary process will start at some seral stage of ecosystem succession with life forms adapted to the existing environment and progress over a long period of time to a climax

condition which may or may not be the present climax community. Rehabilitation measures would not restore the climax, but would produce an advanced seral stage.

4. Human Interest Values

Scarring, alteration of the landscape, or unsightly surface disturbance would constitute major visual impacts associated with both exploration and field development. Pipelines, transmission lines and plant facilities would also create visual impacts. It would be difficult to adequately minimize the visible impacts to the area.

All operations, especially drilling, construction, pipelines and unplanned access routes, would destroy the mood of isolation and the semi-private nature of the area, as well as the visual aesthetics.

Quality of primitive roadless areas would be permanently impacted through access construction, drill site preparation and field development.

Work done in the vicinity of high recreation use areas will detract from the total recreational experience. If development and operation occur within these areas, the uses would not be compatible and the impact could be lasting.

Work site and access preparation would have high impact if carried out within unique or significant ecological areas. As an example, surface disturbance to the alpine community would cause the destruction of the frail ecosystem within the unique area. Other significant areas that could be damaged or lost are the bristlecone pine areas, the Engelmann spruce areas and the stream environments for red-banded trout in Chino and Winters Creeks or the Humboldt trout in Fraizer Creek.
There is a vast amount of historical and archeological information within the subject area that could be lost with indiscriminate land disturbance. Furthermore, indiscriminate clearing within pinyon types would conflict with Indian pinenut gathering.

The influx of workers in the exploration and development stage could cause an overloading of present community services, schools and housing. This would be offset some by the economic boom that would follow and the additional taxable base for the county.

Other benefits would be production of oil and gas or electrical energy to maintain a viable industry in this country and assist with global energy problems; utilization of high quality thermal waters for agricultural or other beneficial uses such as heating, recreation, livestock waters, wildlife habitat, hydrophonic agriculture; and extraction of mineral by-products.

## B. Possible Mitigating or Enhancement Measures

Mitigation of most of the potential environmental problems and impacts from oil-gas or geothermal exploration and development can be accomplished through enforcement of applicable Federal, state and local laws and regulations, lease and land use permit stipulations, and application of existing and yet to be developed technologies. Further mitigating measures are contained within the particular regulations pertaining to oil and gas or geothermal exploration and leasing, operating regulations and the oil and gas or geothermal secretarial operating orders.

Known and anticipated impacts have been included in this analysis. Unanticipated environmental impacts which become apparent as a result of oil-gas or geothermal resource development will be mitigated before implementation of a plan of operation.

General mitigating or enhancement measures are listed as follows:

a - Through leasing, it is hoped that discoveries will be made which in some way will ease the energy shortage by releasing fossil fuels for energy production.

b - Geothermal provides a direct, environmentally sound energy conversion with minimal surface disturbance and no consumption of fuel. It is also considered renewable for an indefinite period of years, depending upon underlying geology and thermal characteristics.

c - Development would add taxable base to the local county and can provide other benefits mentioned previously.

d - In the close-out phase of each stage, removal of all surface plant and equipment, plugging of wells, obliteration of roads and plant sites, filling of evaporation-cooling ponds, and reseeding of all disturbed areas would be required and would mitigate the surface disturbance impact to a significant degree.

e - Lease potential areas with the provision that restrictions may be stipulated in the lease to protect the environment.

### 1. Air Quality and Sanitation

a. The standards as established for the state of Nevada shall be observed and will partially mitigate air quality and sanitation impacts.

b. Surface burning of waste material will be restricted to only brush cleared during site construction.

c. All garbage, debris and foreign matter will be removed to a legally established sanitary landfill. This will mitigate the impact.

d. Toxic drilling fluids must be disposed of in a nonpolluting manner. (See "Water Quality and Supply", paragraph b.)

e. With operation of a geothermal field, special measures may be required to control odor.

f. When dusty conditions develop with road use, dust abatement measures may be required.

## 2. Water Quality and Supply

a. The hole may penetrate pervious beds and depending upon the hydrologic conditions, these zones may produce fluids or be overpressured by the hydrostatic column. In the event that the hole takes fluid, the use of bentonite and a proprietary chemical (Q-trol) will prevent continued loss of drilling fluid to the formation. Formations with positive heads can be controlled through the use of weighting agents to increase the density of the fluid column. Upon completion, the hole should be filled with cement to prevent fluid migration between aquifers or to the surface.

b. Drilling fluids or cuttings shall not be discharged onto the surface where such discharge will contaminate lakes and perennial or intermittent streams. Excavated pits or sumps used in drilling will be backfilled as soon as drilling is completed and restored to conform with the original topography. If necessary to allow evaporation before backfilling, the sumps shall be completely fenced so as to prevent damage to domestic animals or wildlife.

c. Where water quality is good, steps should be taken to develop the aquatic animal habitat within the evaporator pond area or other potential beneficial uses.

d. Every effort should be made to prevent oil spills. Should an accident occur, the following applies:

(1) On-the-ground supervisory personnel should be trained in proper techniques of handling and clean-up of oil spills.

(2) Emergency access to earth-moving equipment and proper clean-up materials is essential.

(3) Holding tanks should be surrounded by impermeable dikes or berms to hold spilled oil.

(4) Following is a suggested plan of action:

(a) Emergency Action

I Notification of appropriate officials. (Federal, State and Local)
II Stop or control cause of spill.
III If possible, contain spill with temporary dikes or dams.

(b) Clean-up of Oil

Oil should be disposed of in a non-polluting manner, preferably a refinery process and not buried in place.

(c) The area involved should be restored to approximate original condition.

(d) Operator should be assessed for surface damage.

It is recommended that oil spills not be mixed with soil as a means of disposal. This practice may cause more ultimate damage than allowing the spill to remain on the surface.

e. Drill sites should be located away from drainages to allow a margin of safety should a blow-out or spill occur. All sites within 1/2 mile of live or ephemeral waters must have impermeable reservoirs capable of retaining drilling wastes or spills.

f. Drill sites should be of sufficient distance from fresh, cold water springs to reduce the chance of flow interference. A recommended safe distance is at least 1/4 mile, but may vary with geologic structure.

g. Surface water, which affects aquatic and marsh habitat, can only be utilized at or near its terminal point of flow. The amount of utilization will be determined by the land management agencies authorized officers.

h. Any discharge of water into surface waters of the subject area will be in accordance with State water quality standards.

3. Land and Vegetation

a. During exploration, confine travel, whenever practical, to established roads or trails. Where off-road travel is necessary, confine equipment to a single route and drive along the contour as much as possible.

b. In all stages, restrict vehicle travel, parking and storage to minimum required areas.

c. In all stages, vegetation removal will be minimized. For minimum disturbance during the development stage, plan only for absolutely necessary roads, (plan for the aesthetics) pipelines, scraped off areas, excavation, etc. Eliminate any unnecessary activities of this sort in the planning stage.

d. Any road blading will require approval by the land management agency's authorized officer. During the exploratory stage, such clearing must be done with as little disturbance to the soil and sod as possible. Where soil is removed in well site and storage areas, the top soil must be stockpiled for subsequent rehabilitation work. Replacement of top soil will enhance rehabilitation efforts.

e. Road construction during the development and operational stage shall be done in compliance with the minimum standards of the land management agencies.

f. During all stages, locate roads, structures, powerlines, pipelines, etc., in a manner that blends with the landscape.

g. To prevent rutting and surface damage during wet periods, surface occupancy and road use may be restricted by the land management agency's authorized officer. Such restrictions would most likely be implemented during the period from 3/1 to 6/30.

h. Soil erosion is a high impact in many soil types. For control, the following measures are recommended:

(1) Locate wells properly.

(2) Employ erosion protection measures if wells must be located on highly erodible soils.

(3) The slope of cut areas be kept to 15 degrees or terraced.

(4) Permanent work areas - well sites, parking lot, roads, storage tanks, cooling towers, etc. - should be graveled to prevent erosion and dust production.

(5) Revegetation should be done as soon as possible to prevent erosion and the invasion of halogeton and Russian thistle. All scraped areas should be revegetated shortly following close-out of work in the area. Revegetation will vary by site condition; therefore, method and species use will be recommended per site by the land management agencies.

i. Measures will be taken to protect aquatic, meadow and tall riparian vegetation areas.

4. Animals

a. For waterfowl nesting and seclusion; and aquatic habitat protection, no surface occupancy will be allowed within 1 1/2 miles of the marsh areas as follows:

(1) Warm Springs marsh area
(2) Franklin Lake marsh
(3) Ruby Lake Wildlife Refuge.

b. No surface occupancy will be allowed within two miles of sage grouse strutting grounds during the period of 3/1 to 5/31. This is in accord with the Western Sage Grouse Committee recommendations for protecting mating grounds, nesting areas, and brood-rearing lands.

c. Surface disturbance within identified deer winter ranges must be minimized for continued forage production.

d. No surface occupancy will be allowed within 1/2-mile of golden eagle or prairie and peregrine falcon nesting sites during the breeding, incubation and rearing period of 3/1 to 6/30.

e. Surface occupancy within 1/4-mile of the Chino and Winters Creeks will not be allowed - These streams support the red-banded trout, a unique unclassified species.

f. Surface occupancy within 1/4-mile of Fraizer Creek will not be allowed. This stream is the specie type location for the threatened Humboldt cutthroat trout.

g. Steps should be taken to prevent electrocution of eagles, hawks and other birds in designing electric transmission lines, substations and other electrical power facilities.

h. Plant sites should be fenced so as to provide protection for livestock and wildlife.

i. Good quality waste water should be utilized in a manner beneficial to wildlife and livestock.

j. The lessee should be requested to advise exploration and other crews concerning the adverse effects of harassing wildlife and wild horses.

k. Damage resulting directly or indirectly from drilling on, or adjacent to, critical habitat is the responsibility of the operator and all rehabilitation of the damaged area should be accomplished by the operator. Meadow areas must also be protected.

5. Human Interest Values

a. Surface disturbance and occupancy will not be allowed until an archeological investigation of all sites and areas upon which the surface will be disturbed has been conducted (constructed roads, drill sites, waste disposal ponds, powerline tower or pole sites, pipeline ROWs, building sites, actual power plant locations, gravel pits and/or quarries and any area to be graded, graveled or paved).

If antiquities or other objects of historic or scientific interest, including historic or prehistoric ruins, vertebrate fossils or artifacts are discovered, they should be left intact and immediately brought to the attention of the land management agency. No surface occupancy will be allowed within the Allegheny Creek Archeological Area-USFS.

b. All survey monuments, witness corners, reference monuments and bearing trees should be protected against destruction, obliteration, or damage. The permittee should report any damage or obliterated markers to the BLM.

c. Surface occupancy and exploration will not be allowed within 1/2 mile of designated recreation sites. USFS sites are protected through withdrawals.

d. Historical values within the subject area must be protected.

e. Surface occupancy will not be allowed within the high use recreational areas without the written permission of the land management agency. These areas are not designated as recreation sites at this time; however, the use is significant. Refer to Page 51 and Exhibits A and B.

f. Surface occupancy will not be allowed within the Bear Creek and Brown's Gulch watersheds. These provide culinary water to Jarbidge and Mountain City.

g. No surface occupancy will be allowed immediately adjacent (within 1 1/2 miles) to the Warm Springs marsh areas, the Franklin Lake and the Ruby Lake National Wildlife Refuge. These are crucial waterfowl nesting areas within an area lacking this type of habitat.

h. No surface occupancy nor exploratory work shall be allowed within roadless, primitive areas currently being considered for designation or withdrawal without the written authorization from the land management agency.

These areas are:

(1) The Independence Mountains - USFS
(2) The Copper Mountain, the Mahoganies and the Jarbidge Mountains - Northern Humboldt USFS
(3) The Ruby and East Humboldt Mountains - USFS
(4) The South Fork of the Owyhee River - Elko District
(5) The Goshute Mountains - Elko District
(6) Bad Lands of the Salmon Falls River - Elko District
(7) Wilson Creek - Elko District and USFS
(8) Rough Hills - Elko District
(9) The South Fork of the Little Humboldt River - Elko District.

i. No surface occupancy shall be allowed adjacent to or in the Bruneau River gorge or the East Fork of the Jarbidge River gorge. These are presently being considered for wild and scenic river designation by the Boise District.

j. No leasing will be allowed within the boundaries of the Jarbidge Wilderness Area presently under protective withdrawal. The area is very rough, mountainous and roadless.

k. No leasing will be allowed within the designated Ruby Mountains Scenic Area. This area is highly scenic and recreational use is heavy.

l. No surface occupancy will be allowed within the Pearl Creek bristlecone pine area; and the Cherry Creek or Pilot Peak Engelmann spruce area. These are unique areas supporting national interest or locally rare tree species.

m. Leasing activities within the pinyon-juniper vegetative zone of the SE 1/4 of the subject area will be coordinated with the Nevada Inter-tribal Council. This is in compliance with a cooperative agreement.

n. Excessive interference with activities of legitimate users of the National Forest and National Resource Lands must be avoided.

o. The area will be impacted by an increase in oil field - geothermal exploratory and development workers. The impact can only be partially mitigated through local governmental action. During all stages of the resource development, there will be beneficial economic impacts affecting primarily the local economy.

## C. Residual Impacts

### 1. Air Quality and Sanitation

Through considering the mitigating measures, there would be no significant residual impacts.

### 2. Water Quality and Supply

Through application of the mitigating measures, most impacts would be eliminated or significantly mitigated. Some possible significant impacts are:

a. Oil and briny water spills are a problem. Within the range ecosystem, these oil spills have been small and have had little impact, however, in a marsh and pond, a small oil spill is quickly and effectively spread over the surface. This impact on a small pond can be fatal to much of the pond and pond life, depending on the extent and degree of oil spillage.

b. If water is lost from aquifers or polluted during drilling operation, the impact would last at least for many years or even indefinitely.

c. Beneficial use of discovered and developed groundwater upon close-out of the various leasing stages.

### 3. Land and Vegetation

Development of oil-gas or geothermal resources would have a cumulative residual impact in that the evidence of the presence of man and his works would be evident for years to come. The traces of roads and pipelines, and the location of physical plant sites would be evident to the trained observer for thousands of years, no matter how thoroughly restoration and reclamation are done. Residual impacts in the surrounding areas cannot be realistically evaluated at this time.

The interruption of the stability of the ecosystem within the area cannot be avoided. Scarring of the landscape, removal of the native vegetation, increased air pollution and vehicular activities can only be partially mitigated by proper reclamation and control of activities.

Underground changes in geology and hydrology could result in subsidence and alter the physical character of the land.

### 4. Animals

The development and operation stage of oil-gas or geothermal resources would produce significant impacts through loss of livestock forage and suitable wildlife habitat. Subsequent rehabilitation will not fully-restore the site productivity.

The wild horse will likewise be impacted by development of the energy producing field; however, the significance may be of minor consequence as discussed earlier.

### 5. Human Interest Values

Even with rehabilitation, the evidence of man's surface disturbance will provide conflict with the natural scenic value. Hopefully, the mitigating measures will be effective yielding low residual impacts.

A possible beneficial impact is the remaining features may possess historical value for future generations.

## D. Relationship Between Short-Term Use and Long-Term Productivity

Short-term use would be the exploratory and production stage of the energy producing resources. This stage would be accomplished during a relatively short time span for most of the subject area. Only on relatively small areas having significant geologic features would this use continue until full economic utilization is achieved.

Upon completion of this stage, the lands would be rehabilitated and former uses restored as much as feasible.

The long-term productivity of all land uses would depend upon the degree of development and surface disturbance. If oil is not discovered, the exploration sites can be rehabilitated with little or no effect on long-term productivity. The more intensive and widespread use becomes, the greater will be the influence upon long-term production.

The two basic elements most significant in determining long-term productivity are soils and water. With significant impacts upon these, the effect would be lasting. Soil loss reduces productivity of vegetation, wildlife, livestock and quality water. A loss or reduction of ground and surface waters would reduce productivity of aquatic life forms, and could impact productivity of cropland.

## E. Irreversible and Irretrievable Commitments of Resource

### 1. General commitments of resource associated with both types of energy producing resources are:

a. Permanent landscape scars remaining from construction and development activities within the energy producing fields.

b. Losses of specific populations of plants and animals would be irretrievable, but the same species could be either naturally or artifically reintroduced.

c. Modification of the ecosystem would likely be irretrievable because of changes in vegetative composition induced by construction and rehabilitation activities. This could affect animal succession as well.

d. There could be some inadvertent loss of archeological and historical features.

e. There will be an irretrievable loss of revenue from leases of lands suitable for lease, but unleased due to restrictions.

### 2. With geothermal energy production, the possible commitments are:

a. Depletion of thermal energy and water from the geothermal reservoir. Both of these resources are renewable but not within the life span of a specific project.

b. Consolidation of aquifers in the geothermal reservoir, and the land subsidence and changes in surface drainage patterns, etc., that may result from removal of fluids from the geothermal reservoir.

### 3. With oil and gas production, the possible commitments are:

a. The irretrievable consumption of the oil or gas to levels exceeding economic technological recovery methods.

b. Depletion of water from the subsurface reservoir could occur and become permanent.

## (II) Alternative Actions

### Alternative No. 1 - Allow Leasing Governed Only by the Standard Stipulations

### A. Anticipated Impacts

The impacts would be the same, but more intensive than as for the Proposed Action. Damage to wildlife and the watershed would increase under this alternative as explained in the Proposed Action. Critical areas could not be identified and activity restricted by the land management agency. Surface occupancy would occur unrestricted on both leased and unleased lands as happened locally during the early 1950s. Operator costs may be reduced to some extent.

### B. Possible Mitigating and Enhancement Measures Associated with Alternative No. 1

These measures would be the same as for the Proposed Action.

### C. Residual Impacts - Alternative No. 1

These impacts would be the same as for the Proposed Action, with the exception that the water areas would be in jeopardy from oil spills, briny pollution, erosion would increase, and deer, sage grouse and waterfowl production would be adversely affected. Unrestricted road construction would result in aesthetic damage to a much higher degree.

### D. Relationship Between Short-Term Use and Long-Term Productivity - Alternative No. 1

This would be the same as shown under the Proposed Action. The exceptions would be possible increased revenue from total leasable lands and possibly more significant impacts upon long-term productivity.

### E. Irreversible and Irretrievable Commitments of Resources

The commitments would be similar to the Proposed Action, but more severe in ecological damages.

## Alternative No. II - Decline Lease Action

### A. Unmitigated Impacts

A decision not to lease could seriously hamper efficient development of the resource on private lands due to the "checkerboard" land ownership pattern. Companies now exploring oil or gas or geothermal resources on alternate private sections in the area have been doing so with the expectation that adjoining NRL would also become available to round out their potentially economic production units.

Alteration of the area's existing environment will occur to a significant degree whether the Bureau leases or not due to oil or gas geothermal exploration of private lands. However, direct impacts to national resource lands due to surface disturbance would not occur.

The decision would furthermore be contrary to local, state and national attitudes and expectations concerning economic productivity, local benefits and assurance of energy reserve to meet growing needs.

### B. Possible Mitigating Measures

Lease all potential areas and incorporate mitigating measures outlined in the Proposed Action. The future development of less destructive exploration techniques and more effective accident prevention and restoration methods might result in the ability to lease the restricted lands at a later date with reduced environmental impacts.

Develop other energy sources and technologies - nuclear and solar.

### C. Residual Impacts

The loss of a potential energy source at a time of national energy need could not be avoided. Also, a substantial loss in lease revenue and possible loss in production royalties would result.

Other energy alternatives may be much more degrading to the total environment or produce irreversible impacts upon resources and the human environment.

D. Relationships Between Short-Term Use and Long-Term Productivity

There would be no effect on productivity of plants and animals. A possible delay or loss of energy production would result and could cause setbacks in economic growth and productivity.

E. Irreversible and Irretrievable Commitment of Resources

No irreversible or irretrievable impacts would occur except loss of revenue from leases as there would be no commitment of resources.

Alternative No. III - Postpone Pending Further Study

Under this alternative, the land management agencies would wait to observe the actual environmental impacts of geothermal resource leasing or development elsewhere and results of developing geothermal and oil or gas technologies. Under this alternative, the environmental impacts would probably be analyzed on smaller restrictive areas where geological structure is highly promising.

In view of this, it may be concluded the short-term effect would be identical to Alternative No. II and the long-term effect would be identical to the Proposed Action.

## V. RECOMMENDATIONS FOR MITIGATION OR ENHANCEMENT OF ENVIRONMENTAL IMPACTS:

### A. General

### Oil and Gas Lease

The "open-end" stipulation requires submission of an activity plan to the USGS and BLM prior to the implementation of the Development Stage. At this time, the USGS prepares an environmental impact analysis to cover the Development, Production and Abandonment phases of activity. Stipulations relative to impacts not provided for in the standard lease (Form 3120-3), and the "open-end" stipulations (Form 3109-3 USFS, Dept. of Agriculture), can be required as they apply to the development site.

### Geothermal Lease

The geothermal lease program is subject to a wide variety of controls under authorities of the USGS and BLM.

1. Prior to issuance of a lease (Form 3200-21), the applicant is required to submit a proposed exploration plan. This is reviewed by the land management agency and USGS.

2. There are Geothermal Resources Operational Orders (GRO) designed for regions and updated periodically following consultation with land management agencies.

3. Prior to commencing any operations on a lease, the lessee must submit a detailed plan of operation and receive approval from the land management agency and the USGS.

B. The mitigation of impacts in the drilling, production and abandonment phases will require close coordination among the land management agency personnel, the Geological Survey and the geothermal or oil and gas lessees. The standard lease stipulations (refer to Attachment III), will mitigate the majority of the identified probable impacts. In addition, special stipulations for adequate environmental protection should be incorporated into the leases and are specified as follows:

### 1. Unstable Soils

The leased lands may contain unstable/highly erodible soils. Therefore, prior to entry onto the lands, the lessee (operator) will discuss the proposed activities jointly with the (Area Oil and Gas Supervisor) and the District Manager who may require additional measures for the protection of the soils. Such measures may include:

1. No surface occupancy of selected areas.

2. Restriction on surface entry during periods of excessive runoff.

3. Special reclamation techniques.

2. Sage Grouse

The following described lands have been identified as critical habitat for the mating, nesting and brood rearing of sage grouse. Therefore, prior to entry onto the lands, the lessee (operator) will discuss the proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor, and the District Manager who may require additional measures for the protection of the sage grouse. Such measures may include:

1. No surface occupancy on the actual strutting grounds.

2. Restriction of activity during the months of April through July in brood rearing areas.
Sage Grouse Strutting Grounds
See Illustration XIV, Page 41(b)

3. Antelope

The following described lands support antelope populations within the Elko District. These areas contain specific habitat types and conditions selected by antelope as kidding areas. Therefore, prior to entry upon public lands within the described areas, the lessee (operator) will discuss proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor, and the District Manager who may require additional measures for the protection of antelope. Such measures may include:

1. No surface occupancy on actual kidding grounds.

2. Restriction of activity in these areas for the months of June and July.

Antelope Ranges

Ts. 44,45,46,47 N. - Rs. 45,46,47,48 E.
Ts. 45,46 N. - Rs. 61,62 E.
T. 47 N. - Rs. 63,64 E.
Ts. 30,31 N., R. 60 E.
Ts. 27,28 N., R. 64 E.
Ts. 26,27 N., R. 68 E.

## SAGE GROUSE STRUTTING GROUNDS

| SITE NAME | LAND STATUS | LOCATION |
|---|---|---|
| Elko Co. #2 | NRL | T. 26N, R. 61E, Sec. 14-23 |
| Big Canyon | NRL | T. 26N, R. 64E, S. 6: SE 1/4 |
| Sadler Ranch | NRL | T. 27N, R. 55E, S. 24: NW 1/4 |
| Elko Co. #1 | NRL | T. 27N, R. 61E, S. 36 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 12: N 1/2 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 12: S 1/2 |
| Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 13: NE 1/4 |
| So. Calf Canyon Bench | NRL | T. 27N, R. 63E, S. 13: SE 1/4 |
| McDermitt Bench #1 | NRL | T. 27N, R. 64E. S. 29: NW 1/4 |
| McDermitt Bench #2 | NRL | T. 27N, R. 64E, S. 30: SW 1/4 |
| Pearl Creek | NRL | T. 28N, R. 56E, S. 26 |
| Elko Co. #3 | NRL | T. 28N, R. 62E, S. 30-31 |
| So. Cottonwood Bench #1 | NRL | T. 28N, R. 63E, S. 14: SE 1/4 |
| So. Cottonwood Bench #2 | NRL | T. 28N, R. 63E, S. 23: NW 1/4 |
| So. Cottonwood Bench #3 | NRL | T. 28N, R. 63E, S. 24: NW 1/4 |
| So. Cottonwood Bench #4 | NRL | T. 28N, R. 63E. S. 25: NW 1/4 |
| Green Mtn. Creek | FS | T. 29N, R. 57E, S. 31: SW 1/4 |
| Elliot Ranch | NRL | T. 30N, R, 53E, S. 11 |
| Dixie Flat | NRL | T. 30N, R. 53E, S. 12: SE 1/4 |
| Zunino Creek | NRL | T. 30N, R. 56E, S. 27: NW 1/4 |
| Kelly Store | NRL | T. 30N, R. 59E, S. 19: NW 1/4 |
| South Spruce | NRL | T. 30N, R. 64E, S. 28: NW 1/4 |
| Bullion Road | NRL | T. 31N, R. 54E, S. 16: NW 1/4 |
| Stonier Ranch | NRL | T. 31N, R. 59E. S. 10: NE 1/4 |
| Loading Shute | NRL | T. 31N, R. 61E, S. 6: N 1/2 |
| High Beach | NRL | T. 31N, R. 61E, S. 7: SE 1/4 |
| 10 Mile Road | NRL | T. 32N, R. 55E, S. 1 : NW 1/4 |
| Dixie Creek | NRL | T. 32N, R. 54E, S. 23: SE 1/4 |
| E. White Flats | NRL | T. 32N, R. 55E, S. 16: SW 1/4 |
| W. White Flats | NRL | T. 32N, R. 55E, S. 20: SW 1/4 |
| Sheep Creek | NRL | T. 32N, R. 56E, S. 24: NE 1/4 |
| Round Meadow | NRL | T. 32N, R. 60E, S. 24: SE 1/4 |
| Long Ridge | NRL | T. 32N, R. 60E, S. 24: SW 1/4 |
| Round Knoll | NRL | T. 32N, R. 61E, S. 7: NE 1/4 |
| Road Junction | NRL | T. 32N, R. 61E. S. 7: SW 1/4 |
| Second Beach | NRL | T. 30N, R. 62E, S. 1: W 1/2 |
| S. Clover Valley | NRL | T. 32N, R. 62E, S. 2: NE 1/4 |
| First Beach | NRL | T. 32N, R. 62E, S. 2: NW 1/4 |
| Mile 39 | NRL | T. 32N, R. 62E, S. 6: SW 1/4 |

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|---|---|---|
| Moffat Reservoir | NRL | T. 33N, R. 56E, S. 6: NW 1/4 |
| Indian Reseeding | NRL | T. 33N, R. 56E, S. 31: SW 1/4 |
| Lee Road | NRL | T. 33N, R. 56E. S. 36 |
| Reseeded Area | NRL | T. 33N, R. 61E, S. 31: NW 1/4 |
| Snow Fence | NRL | T. 33N, R. 61E, S. 36: NW 1/4 |
| Warm Creek | NRL | T. 33N, R. 62E, S. 32 |
| Flat Complex | NRL | T. 33N, R. 62E, S. 32: SW 1/4 |
| Ravine Reservoir | NRL | T. 33N, R. 62E, S. 33: SW 1/4 |
| ----------- | NRL | T. 34N, R. 52E, S. 21 |
| Elko Summit | NRL | T. 34N, R. 56E, S. 32: SW 1/4 |
| Dry Lake Res. | NRL | T. 34N, R. 57E, S. 18: NE 1/4 |
| ----------- | NRL | T. 34N, R. 57E, S. 33: SE 1/4 |
| Izzenhood #2 | NRL | T. 35N, R. 46E, S. 2 |
| Izzenhood #1 | NRL | T. 35N, R. 46E, S. 4 |
| Adobe Summit | NRL | T. 35N, R. 54E, S. 36: NW 1/4 |
| Jack Cr. Rd. | NRL | T. 36N, R. 46E. S. 14 |
| 16 Mile Creek | NRL | T. 36N, R. 54E, S. 34: NE 1/4 |
| Dinner Station | NRL | T. 36N, R. 54E, S. 34: NE 1/4 |
| N. Six Mile #1 | NRL | T. 37N, R. 46E, S. 28: NW 1/4 |
| Mud Springs | NRL | T. 37N, R. 54E, S. 6 |
| BLM - 28 | NRL | T. 37N, R. 54E, S. 34: SW 1/4 |
| Stampede Cr. | NRL | T. 38N, R. 52 E, S.28: SE 1/4 |
| Eagle Rock | NRL | T. 38N, R. 53E, S. 5: NW 1/4 |
| Upper Maggie Cr. | NRL | T. 38N, R. 53E, S. 6: SW 1/4 |
| Lake Creek | NRL | T. 38N, R. 53E, S. 33: SE 1/4 |
| Meadow Cr. | NRL | T. 38N, R. 54E, S. 6: SW 1/4 |
| Reed's Station | NRL | T. 38N, R. 54E, S. 19 |
| McClelland Cr. | NRL | T. 38N, R. 54E, S. 22: NW 1/4 |
| Mary's R. Junct. | NRL | T. 38N, R. 59E, S. 10: SE 1/4 |
| Kundseen Ranch | NRL | T. 38N, R. 61E, S. 1 |
| Hot Springs | NRL | T. 38N, R. 62E, S. 17: SW 1/4 |
| Taylor Summit | NRL | T. 39N, R. 53E, S. 32: SE 1/4 |
| Taylor Pass | NRL | T. 39N, R. 53E, S. 33: SE 1/4 |
| Midas Creek | NRL | T. 39N, R. 46E, S. 32: SE 1/4 |
| Ridge Rd. #3 | NRL | T. 39N, R. 48E, S. 1: NE 1/4 |
| Ridge Rd. #2 | NRL | T. 39N, R. 48E, S. 11: SE 1/4 |
| Ridge Rd. #1 | NRL | T. 39N, R. 48E, S. 20: NW 1/4 |
| Packer Ranch | NRL | T. 39N, R. 51E, S. 22: NW 1/4 |
| Tule Seeding | NRL | T. 39N, R. 55E, S. 22 |
| Lambing Shed | NRL | T. 39N, R. 58E. S. 22: NW 1/4 |
| E. Devils Gate | NRL | T. 39N, R. 58E, S. 30: NW 1/4 |
| Ten Mile Hill | NRL | T. 39N, R. 63E, S: 10 |
| Bishop Flat Ridge | NRL | T. 39N, R. 63E, S: 16 |

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|---|---|---|
| Tuscarora | NRL | T. 40N, R. 51E, S. 25: SE 1/4 |
| Six Mile | NRL | T. 40N, R. 52E, S. 19: SE 1/4 |
| South Owyhee | NRL | T. 40N, R. 52E, S. 29: SE 1/4 |
| Taber Creek | NRL | T. 40N, R. 61E, S. 7 |
| Harrington Cr. | NRL | T. 41N, R. 52E, S. 3: SE 1/4 |
| S. Pratt #1 | NRL | T. 41N, R. 54E, S. 12 & 13 |
| Winters Creek | NRL | T. 42N, R. 48E, S. 36: NE 1/4 |
| Delaware | NRL | T. 42N, R. 54E; S. 1 |
| Delaware #2 | NRL | T. 42N, R. 55E, S. 2: SW 1/4 |
| East Owyhee | NRL | T. 42N, R. 55E, S. 8: SE 1/4 |
| West Beaver #2 | NRL | T. 42N, R. 56E, S. 8: SE 1/4 |
| West Beaver #1 | NRL | T. 42N, R. 56E, S. 9: SE 1/4 |
| West Beaver #3 | NRL | T. 42N, R. 56E, S. 18: SE 1/4 |
| Harris | NRL | T. 42N, R. 65E, S. 14: NE 1/4 |
| Sheep Cr. | NRL | T. 43N, R. 52E, S. 34: NE 1/4 |
| Jack Cr. | NRL | T. 43N, R. 55E, S. 17 |
| ~~Crooked Cr.~~ | ~~NRL~~ | ~~T. 43N, R. 56E. S. : NE 1/4~~ |
| Mt. Ichabod | NRL | T. 43N, R. 56E, S. 25: SE 1/4 |
| Mason | NRL | T. 43N, R. 56E, S. 36: NE 1/4 |
| Hedriks Cr. #1 | NRL | T. 44N, R. 55E, S. 20 |
| Hendriks Cr. #2 | NRL | T. 44N, R. 55E, S. 21: SW 1/4 |
| Cattleguard | NRL | T. 44N, R. 55E, S. 28: SW 1/4 |
| Wildhorse Meadow | NRL | T. 44N, R. 55E, S. 29: SE 1/4 |
| Gold Creek | NRL | T. 44N, R. 56E, S. 7: SE 1/4 |
| Cottonwood Cr. Bench | NRL | T. 44N, R. 60E, S. 3:SW 1/4 |
| N. Camp Cr. Bench | NRL | T. 44N, R. 60E, S. 9: NE 1/4 |
| E. Willow Spring | NRL | T. 44N, R. 60E, S. 13: NW 1/4 |
| S. Camp Creek #1 | NRL | T. 44N, R. 60E, S. 14: SE 1/4 |
| N. Willow Spring | NRL | T. 44N, R. 60E, S. 16: SE 1/4 |
| S.W. Camp Cr. | NRL | T. 44N, R. 60E, S. 17: NE 1/4 |
| Willow Springs | NRL | T. 44N, R. 60E, S. 21: NE 1/4 |
| S. Camp Creek #2 | NRL | T. 44N, R. 60E, S. 24: NW 1/4 |
| East Fork | NRL | T. 44N, R. 60E, S. 29: SE 1/4 |
| Gilmer Ranch | NRL | T. 44N, R. 60E, S. 17 |
| Airport | FS | T. 45N, R. 53E, S. 6: NW 1/4 |
| Haystack | FS | T. 45N, R. 54E, S. 17: NE 1/4 |
| Allegheny | FS | T. 45N, R. 54E, S. 20: NE 1/4 |
| Chicken Creek | NRL | T. 45N, R. 55E, S. 33 |
| Sunflower | NRL | T. 45N, R. 55E, S. 36 |
| Goat Cr. Table | NRL | T. 45N, R. 60E, S. 13: NE 1/4 |
| South Buckhorn | NRL | T. 45N, R. 61E, S. 5: SE 1/4 |
| Canyon Cr. Bench | NRL | T. 45N, R. 61E, S. 20: NW 1/4 |
| Twin Meadows | NRL | T. 45N, R. 62E, S. 17: NE 1/4 |

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|---|---|---|
| Willow Cr. Ridge | FS | T. 46N, R. 61E, S. 11 |
| Helsley Ranch | NRL | T. 46N, R. 62E, S. 4 |
| Plantation | NRL | T. 46N, R. 62E, S. 17 |
| Bald Ridge | NRL | T. 46N, R. 62E, S. 33 |
| Milligan Cr. #2 | NRL | T. 46N, R. 67E, S. 5: NE 1/4 |
| Little Goose Cr. | NRL | T. 46N, R. 68E, S. 19: NE 1/4 |
| | | |
| Hawes Creek | FS | T. 47N, R. 62E, S. 19: NW 1/4 |
| Wilson Creek | NRL | T. 47N, R. 62E, S. 31 |
| Wilson Ranch | NRL | T. 47N, R. 62E, S. 32: NW 1/4 |
| Gully Ranch | NRL | T. 47N, R. 62E, S. 33 |
| Section 6 | NRL | T. 47N, R. 63E, S. 6: NE 1/4 |
| Brown's Bench #1 | NRL | T. 47N, R. 63E, S. 11: NW 1/4 |
| Jeep Trail | NRL | T. 47N, R. 63E, S. 13: NE 1/4 |
| Brown's Bench #2 | NRL | T. 47N, R. 63E, S. 14: NW 1/4 |
| Brown's Bench #3 | NRL | T. 47N, R. 63E, S. 14: SW 1/4 |
| Cottonwood Cr. Bench #1-7 | NRL | T. 47N, R. 63E, S. 22-23 |
| So. Cottonwood Cr. Bench #1 | NRL | T. 47N, R. 63E, S. 24: NE 1/4 |
| So. Cottonwood Cr. Bench #2 | NRL | T. 47N, R. 63E, S. 24: S 1/2 |
| So. Cottonwood Cr. Bench #7 | NRL | T. 47N, R. 64E, S. 5: SE 1/4 |
| So. Cottonwood Cr. Bench #4 | NRL | T. 47N, R. 64E, S. 9: SE 1/4 |
| So. Cottonwood Cr. Bench #5 | NRL | T. 47N, R. 64E, S. 17: SE 1/4 |
| So. Cottonwood Cr. Bench #3 | NRL | T. 47N, R. 64E, S. 19: SW 1/4 |
| S. Cottonwood Cr. Bench #6 | NRL | T. 47N, R. 64E, S. 21: SW 1/4 |
| Grassy Mtn. | NRL | T. 47N, R. 64E, S. 31: W 1/2 |
| Rancho Grande | NRL | T. 47N, R. 65E, S. 25 |
| Cow Creek | NRL | T. 47N, R. 65E, S. 36: SE 1/4 |
| W. Basin Draw #1 | NRL | T. 47N, R. 66E, S. 2: SE 1/4 |
| Horse Creek #2 | NRL | T. 47N, R. 66E, S. 10: NW 1/4 |
| W. Basin Draw #3 | NRL | T. 47N, R. 66E, S. 11: NW 1/4 |
| W. Basin Craw #4 | NRL | T. 47N, R. 66E, S. 11: SW 1/4 |
| Indian Mike Cr. | NRL | T. 47N, R. 66E, S. 12: NW 1/4 |
| Indian Mike Cr. | NRL | T. 47N, R. 66E, S. 12: SW 1/4 |
| W. Basin Draw #6 | NRL | T. 47N, R. 66E, S. 14: NW 1/4 |
| W. Basin Draw #5 | NRL | T. 47N, R. 66E, S. 15: NE 1/4 |
| Horse Creek #3 | NRL | T. 47N, R. 66E, S. 15: SW 1/4 |
| Horse Creek #5 | NRL | T. 47N, R. 66E, S. 15: SE 1/4 |
| Horse Creek #1 | NRL | T. 47N, R. 66E, S. 16: NW 1/4 |
| Indian Mike Creek | NRL | T. 47N, R. 66E, S. 24: SW 1/4 |
| Horse Creek #4 | NRL | T. 47N, R. 66E, S. 28: NE 1/4 |
| Stateline #2 | NRL | T. 47N, R. 67E, S. 2: NW 1/4 |
| Stateline #3 | NRL | T. 47N, R. 67E, S. 2: SW 1/4 |
| Stateline #1 | NRL | T. 47N, R. 67E, S. 3: SE 1/4 |
| Hot Creek #2 | NRL | T. 47N, R. 67E, S. 6: SW 1/4 |
| Indian Mike Creek | NRL | T. 47N, R. 67E, S. 7: NW 1/4 |
| Hot Creek #3 | NRL | T. 47N, R. 67E, S. 7: SE 1/4 |
| Fall Creek #5 | NRL | T. 47N, R. 67E, S. 15: SE 1/4 |
| Fall Creek #3 | NRL | T. 47N, R. 67E, S. 16: SE 1/4 |
| Chicken Spr. #2 | NRL | T. 47N, R. 67E, S. 18: SW 1/4 |
| Chicken Spr. #3 | NRL | T. 47N, R. 67E, S. 19: NE 1/4 |
| Chicken Spr. #1 | NRL | T. 47N, R. 67E. S. 19: SW 1/4 |
| Milligan Creek #7 | NRL | T. 47N, R. 67E, S. 21: NE 1/4 |
| Hot Creek #1 | NRL | T. 47N, R. 67E. S. 6: NW 1/4 |

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|---|---|---|
| Millian Creek #1 | NRL | T. 47N, R. 67E, S. 21: SE 1/4 |
| Bottom Creek | NRL | T. 47N, R. 67E, S. 30: SE 1/4 |
| Milligan Creek #5 | NRL | T. 47N, R. 67E, S. 34: SW 1/4 |
| Fall Creek #1 | NRL | T. 47N, R. 67E, S. 36: SW 1/4 |
| ------------ | NRL | T. 47N, R. 69E, S. 25 |

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|---|---|
| White Pine County Strutting Grounds | T. 25N, R. 58E, S. 17, 18 & 29 |

4. Prairie Falcon

The following described lands have been identified as favorable habitat supporting relatively high population densities of prairie falcons. Therefore, prior to entry onto the public lands within the described area, the lessee (operator) will discuss the proposed activities jointly with the (Area Oil and Gas Supervisor), (Area Geothermal Supervisor) and the District Manager who may require additional measures for the protection of the prairie falcons. Such measures may include:

1. No surface occupancy of selected areas.
2. Restriction of activity near nest sites during the months of March through June.

T. 26 N., Rs. 48-51 E.
T. 27 N., Rs. 48-51 E.
T. 28 N., Rs. 48-51 E.
T. 29 N., Rs. 48-51 E.
T. 30 N., Rs. 48-51 E.
T. 31 N., Rs. 48-51 E.
T. 32 N., Rs. 44-51 E.

T. 34 N., Rs. 44-51 E.
T. 35 N., Rs. 44-51 E.
T. 36 N., Rs. 44-51 E.
T. 37 N., Rs. 44-51 E.
T. 38 N., Rs. 44-51 E.
T. 39 N., Rs. 44-51 E.
T. 40 N., Rs. 44-51 E.
T. 41 N., Rs. 44-51 E.

5. Eagle

The following described lands have been identified as critical for the mating, nesting and rearing of golden eagles. Therefore, prior to entry onto public lands, the lessee (operator) will discuss proposed activities jointly with the Area Oil and Gas Supervisor, Area Geothermal Supervisor and the District Manager who may require additional measures for the protection of eagles Such measures may include:

1. No surface occupancy of selected areas.
2. Restriction of activity near nest sites during the months of March through June.

T. 26 N., R. 55 E., Sec. 19
T. 26 N., R. 57 E., Sec. 2
T. 26 N., R. 66 E., Sec. 1
T. 27 N., R. 57 E., Sec. 24
T. 27 N., R. 68 E., Sec. 20
T. 28 N., R. 57 E., Sec. 27
T. 28 N., R. 64 E., Sec. 4
T. 28 N., R. 68 E., Sec. 1
T. 29 N., R. 57 E., Secs. 3 and 34
T. 30 N., R. 45 E., Sec. 23

T. 30 N., R. 57 E., Sec. 9
T. 30 N., R. 68 E., Secs. 23 and 32
T. 30 N., R. 70 E., Sec. 16, 13 and 23
T. 31 N., R. 57 E., Sec. 10
T. 31 N., R. 64 E., Sec. 35
T. 32 N., R. 48 E., Sec. 32
T. 32 N., R. 53 E., Sec. 8
T. 32 N., R. 54 E., Sec. 7
T. 32 N., R. 55 E., Secs. 5 and 6
T. 32 N., R. 58 E., Secs. 26 and 32
T. 33 N., R. 47 E., Secs. 3 and 18
T. 33 N., R. 50 E., Sec. 16
T. 33 N., R. 53 E., Secs. 1, 23 and 24
T. 33 N., R. 54 E., Secs. 9 and 14
T. 33 N., R. 55 E., Sec. 4
T. 34 N., R. 48 E., Sec. 18
T. 34 N., R. 59 E., Secs. 21 and 23
T. 35 N., R. 48 E., Sec. 26
T. 35 N., R. 53 E., Secs. 13 and 34
T. 35 N., R. 54 E., Secs. 13 and 30
T. 35 N., R. 55 E., Sec. 26
T. 35 N., R. 56 E., Secs. 1 and 36
T. 35 N., R. 66 E., Sec. 30
T. 36 N., R. 45 E., Secs. 3 and 5
T. 36 N., R. 55 E., Sec. 25
T. 36 N., R. 66 E., Sec. 20
T. 36 N., R. 68 E., Sec. 20
T. 37 N., R. 47 E., Sec. 7
T. 37 N., R. 55 E., Secs. 2 and 24
T. 37 N., R. 61 E., Sec. 14
T. 37 N., R. 65 E., Sec. 32
T. 38 N., R. 44 E., Secs. 1 and 16
T. 38 N., R. 54 E., Sec. 10
T. 38 N., R. 56 E., Secs. 12 and 29
T. 38 N., R. 57 E., Sec. 13
T. 38 N., R. 62 E., Sec. 8
T. 38 N., R. 67 E., Sec. 34
T. 39 N., R. 48 E., Sec. 35
T. 39 N., R. 52 E., Sec. 1
T. 39 N., R. 54 E., Sec. 28
T. 39 N., R. 55 E., Sec. 4
T. 39 N., R. 56 E., Secs. 1 and 6
T. 39 N., R. 57 E., Secs. 15 and 26
T. 39 N., R. 62 E., Secs. 26 and 34
T. 40 N., R. 48 E., Sec. 31
T. 40 N., R. 53 E., Sec. 22
T. 40 N., R. 55 E., Secs. 9 and 34
T. 40 N., R. 56 E., Sec. 36
T. 40 N., R. 57 E., Sec. 29
T. 40 N., R. 50 E., Sec. 24
T. 41 N., R. 51 E., Sec. 11
T. 41 N., R. 52 E., Sec. 26

T. 41 N., R. 53 E., Sec. 1
T. 41 N., R. 55 E., Secs. 1 and 32
T. 41 N., R. 57 E., Secs. 27, 28 and 33
T. 41 N., R. 58 E., Sec. 16
T. 41 N., R. 59 E., Secs. 9 and 21
T. 42 N., R. 44 E., Sec. 12
T. 42 N., R. 50 E., Secs. 29 and 34
T. 42 N., R. 51 E., Secs. 33 and 35
T. 42 N., R. 52 E., Sec. 35
T. 42 N., R. 55 E., Sec. 29
T. 42 N., R. 59 E., Sec. 2
T. 43 N., R. 50 E., Sec. 6
T. 43 N., R. 56 E., Sec. 35
T. 43 N., R. 64 E., Sec. 1
T. 44 N., R. 50 E., Sec. 18
T. 44 N., R. 63 E., Sec. 3
T. 44 N., R. 68 E., Sec. 21
T. 44 N., R. 69 E., Sec. 16
T. 45 N., R. 49 E., Sec. 9
T. 45 N., R. 62 E., Secs. 11 and 25
T. 45 N., R. 65 E., Sec. 36
T. 46 N., R. 48 E., Secs. 22 and 36
T. 47 N., R. 47 E., Secs. 12 and 15
T. 47 N., R. 48 E., Sec. 29
T. 47 N., R. 63 E., Sec. 13
T. 47 N., R. 64 E., Secs. 10 and 23
T. 47 N., R. 65 E., Secs. 12 and 21
T. 47 N., R. 68 E., Sec. 3.

## 6. Mule Deer Stipulation

The following described lands have been identified as critical habitat for wintering herds of mule deer. Therefore, prior to entry onto the public lands within the described area, the lessee (operator) will discuss the proposed activities jointly with the (Area Oil and Gas Supervisor), (Area Geothermal Supervisor) and the District Manager who may require additional measures for the protection of mule deer while utilizing these areas. Such measures may include:

1. Restriction of activity in identified areas during the winter months of November through March.

2. No surface occupancy of selected sites.

3. Special reclamation techniques.

Mule Deer Critical Winter Ranges

Ts. 26-28 N., Rs. 62 and 63 E.
Ts. 27 and 28 N., Rs. 60 and 61 E.
Ts. 27, 28 and 29 N., Rs. 49, 50 and 51 E.
Ts. 28 and 29 N., R. 52 E.
Ts. 29 and 30 N., R. 66 E.
Ts. 30 and 31 N., Rs. 63, 64 and 65 E.
Ts. 30-35 N., R. 68 E.
Ts. 33 and 34 N., Rs. 53 and 54 E.
T. 36 N., R. 63 E.
Ts. 36 and 37 N., R. 68 E.
T. 39 N., R. 70 E.
T. 44 N., R. 54 E.
T. 45 N., R. 63 E.
T. 46 N., R. 59 E.

7. No leasing will be allowed on the Ruby Lake National Wildlife Refuge except as provided in 43 CFR 3101.3. See Attachment No. 11.

8. All drilling sites within 1/2-mile of live or ephemeral waters must have impermeable reservoirs capable of retaining drilling wastes and spills.

9. Drill sites will be of sufficient distance from cold water springs to reduce the chance of flow interference. A recommended safe distance is at least 1/4-mile, but may vary with geologic structure.

10. Antiquities and Objects of Historic Value

Oil and Gas Stipulation

The lessee shall immediately bring to the attention of the Authorized Officer any antiquities or other objects of historic or scientific interest, including but not limited to historic or prehistoric ruins, fossils, or artifacts discovered as a result of operations under this lease, and shall leave such discoveries intact. Failure to comply with any of the terms and conditions imposed by the Authorized Officer with regard to the preservation of antiquities may constitute a violation of the Antiquities Act (16 U.S.C. 431-433).

Prior to operations, the lessee shall furnish to the Authorized Officer a certified statement that either no archaeological values exist or that they may exist on the leased lands to the best of the lessee's knowledge and belief and that they might be impaired by oil and gas operations. Such certified statement must be completed by a qualified archaeologist acceptable to the Authorized Officer.

If the lessee furnishes a statement that archaeological values may exist where the land is to be disturbed or occupied, the lessee will engage a qualified archaeologist, acceptable to the Authorized Officer, to survey and salvage, in advance of any operations, such archaeological values on the lands involved. The responsibility for the cost for the certificate, survey, and salvage will be borne by the lessee, and such salvaged property shall remain the property of the lessor or the surface owner.

## Geothermal Energy Stipulation

The certified statement required by Section 18 of the lease form must be completed by a qualified archaeologist, acceptable to the Authorized Officer.

11. Leasing activities within the pinyon-juniper vegetative zone of the SE 1/4 of the subject area will be coordinated with the Nevada Inter-tribal Council.

12. Powerlines and other electrical facilities will be constructed in accordance with REA regulations designed to minimize the electrocution hazard to eagles and other large raptors.

13. Geothermal steam plant architecture should be made to be harmonious with the landscape. Color schemes should blend with the background.

14. Slant drilling should be considered, where feasible, to eliminate a "web" of geothermal steam pipelines from drill sites to the plant.

15. Full consideration should be given to developing aquatic wildlife habitat using geothermal waste water disposal when evaporation ponds are used.

## V. PERSONS, GROUPS AND GOVERNMENTAL AGENCIES CONSULTED:

Nevada Department of Fish and Game
U.S.G.S.
U.S.F.S. - Humboldt National Forest (Staff Personnel)
U.S.F.&W.S. - Ruby Lake National Wildlife Refuge (Staff Personnel)
Elko County Manager
Mary Rosco - Assistant Anthropology Curator - Nevada State Museum
Don Touhy - Anthropology Curator - Nevada State Museum
Howard Hickson - Museum Director - Northeast Nevada Museum
Bill Wright - Rancher - Anthropology M.S. Degree
Harry Peterson - Range Conservationist - Bureau of Land Management

## VI. INTENSITY OF PUBLIC INTEREST:

The public interest in development of both oil and gas or geothermal resources within the subject area runs high. Media coverage concerning geothermal possibilities, constant reminders of the energy crisis (real or contrived), and the actions of the foreign oil producing nations have all stimulated an intense interest in developing the nation's potential energy sources and have fostered a resolve to become self-sufficient in this area.

The local publics and the Nevada Department of Fish and Game are concerned with any practice which adversely affects wildlife populations and aesthetics. The regional people feel about the same, but are also concerned with wild horses.

The general attitudes and concerns are not of a controversial nature.

## VII. PARTICIPATING AGENCY STAFF:

| | |
|---|---|
| Robert C. Mitchell | Area Manager - Boise District, Idaho |
| Alfred Wright | Area Manager - Ely District Office |
| Donald Seibert | Wildlife Specialist - Elko District Office |
| Arlen Jensen | Area Manager-Elko Resource Area-Elko District Office |
| Oscar Anderson | Area Manager-Wells Resource Area-Elko District Office |

District team members providing basic research and data for this writing were:

| | |
|---|---|
| William White<br>Robert Randolph | Geology Information, Scientific and Educational (Geology) Section, and Geology Technical Report |
| Ronald Fellows | Socio-Economics - Land Use |
| David Goicoechea | Wildlife and Aquatic Environments |
| Bruce Portwood | Vegetation and Wild Horses |
| George Ramey | Team Leader and Writer-Editor. |

## VIII. RECOMMENDATION CONCERNING THE NEED FOR AN ENVIRONMENTAL STATEMENT:

The foregoing analysis of environmental impacts reveals many potentially significant conflicts. With the application of the proposed action governed by the general stipulations, regulations, laws, etc., and the special stipulations proposed herein, these impacts can be mitigated with no significant lasting effect upon the environment of the subject area. It is, therefore, concluded that a statement pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969 is not required.

## IX. SIGNATURES:

A. Respectfully submitted:

George W. Ramey
George W. Ramey
Planning and Environmental
Coordinator
Elko District

11/6/74
Date

Wm. W. White
William W. White
Geothermal Specialist
Elko District

6 Nov 1974
Date

Robert L. Randolph
Robert L. Randolph
Geologist
Elko District

11-6-74
Date

B. In cooperation with:

| | |
|---|---|
| John Combs | USFS |
| Vernon Sylvester | USFS |
| Kenneth Chambers | BLM - Ely |
| David Everett | BLM - Battle Mountain |
| Ronald Papike | USF&WS |

United States Department of the Interior
BUREAU OF RECLAMATION
LAHONTAN BASIN PROJECTS OFFICE
P. O. BOX 640
CARSON CITY, NEVADA 89701

2-24
RKT 2/24

LAND MANAGEMENT
NEVADA STATE OFFICE
1975 FEB 24 AM 10 00

IN REPLY REFER TO: 240
706.

FEB. 13, 1975

1791
N-10521
(N-013.1)

Mr. E. A. Moore, District Manager
Bureau of Land Management
2002 Idaho Street
Elko, Nevada 89801

Dear Mr. Moore:

Thank you for your letter dated January 13, 1975, which included two copies of the updated Elko District Area Oil and Gas-Geothermal Steam Leasing Environmental Analysis Record.

The only Reclamation lands in your District are located near Battle Mountain. These lands were acquired by Reclamation for the Humboldt Project. They are leased to the Pershing County Water Conservation District for community pasture purposes. We have consulted with the Water District, and recommend these acquired lands be excluded from the leasing area at this time. We will reconsider this decision should a lease application be filed on any particular parcel of these lands. If an application is filed, we would undoubtedly have special stipulations to protect Reclamation's interests.

Sincerely,

E. C. Malmstrom

E. C. Malmstrom
Project Manager

✓ Dist. Mgr.
✓ Res. Mgt. ttW
✓ Environ. Plan.
Operations
Fire Yard
Admin. Officer
Sup. Cler. Asst.
Bur. of Land Mgt. Elko D.O.
RECEIVED FEB 14 1975
Elko R.A.
Wells R.A.
Reading File
Bulletin Board
✓ File Code 016-Mgt. EAR

CONSERVE
AMERICA'S
ENERGY

*Save Energy and You Serve America!*

## X. REFERENCES:

1. Final Environmental Statement for the Geothermal Leasing Program, Department of the Interior, 1973.

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13. State of Nevada Water Quality Standards.

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21. Environmental Analysis Record, Goshute Oil and Gas Leasing N-7539, Oscar Anderson, et al, 1973.

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24. Archeological Reconnaissance of Northwestern Utah and Northeastern Nevada, September 1970 - by Henry Wylie, Department of Anthropology, University of Utah.

25. Archeological Survey in Eastern Nevada 1966 No. 2 - by Don D. Fowler, Desert Research Institute, University of Nevada System.

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# ATTACHMENT I

## Wells Ranger District - Humboldt National Forest
## Surface Occupancy Allowed for Oil and Gas or Geothermal Leasing

### Mount Diablo Meridian, Elko County, Nevada

T. 27 N., R. 57 E.,
sec. 1, E½E½.

T. 28 N., R. 58 E.,
sec. 5, E½W½;
sec. 8, E½W½;
sec. 17, E½W½;
sec. 20, W½;
sec. 30, E½NE¼, E½SW¼;
sec. 31, E½.

T. 29 N., R. 58 E.,
sec. 3, NW¼;
sec. 9, E½;
sec. 16, SW¼.

T. 30 N., R. 58 E.,
sec. 13, NE¼, W½;
sec. 24, NW¼;
sec. 26, SE¼SE¼;
sec. 34, SE¼SE¼.

T. 30 N., R. 59 E.,
sec. 6, all;
sec. 7, W½.

T. 31 N., R. 59 E.,
sec. 3, W½;
sec. 4, SE¼SE¼;
sec. 6, all;
sec. 7, W½;
sec. 9, S½;
sec. 10, NW¼, SW¼SW¼;
sec. 15, W½NW¼;
sec. 16, all;
sec. 17, E½E½;
sec. 19, E½E½;
sec. 20, all;
sec. 21, NW¼;
sec. 29, W½NE¼, W½;
sec. 30, S½NE¼, SE¼;
sec. 31, N½N½, S½NE¼, SE¼.

T. 32 N., R. 59 E.,
sec. 2, E½W½;
sec. 11, E½SW¼;
sec. 14, NW¼SW¼;
sec. 23, W½SW¼;
sec. 26, W½;
sec. 27, E½SE¼;
sec. 34, W½.

T. 33 N., R. 60 E.,
sec. 4, W½;
sec. 8, E½;
sec. 17, NE¼, SW¼;
sec. 19, NW¼.

T. 33 N., R. 61 E.,
sec. 5, W½;
sec. 8, W½;
sec. 10, E½;
sec. 11, S½;
sec. 14, E½;
sec. 17, W½;
sec. 20, E½;
sec. 22, all;
sec. 23, NW¼;
sec. 28, N½;
sec. 29, N½.

T. 34 N., R. 60 E.,
sec. 28, W½.

T. 34 N., R. 61 E.,
sec. 2, E½W½;
sec. 14, E½E½;
sec. 18, all;
sec. 19, all;
sec. 23, E½E½;
sec. 26, NE¼, W½;
sec. 29, E½, NW¼;
sec. 30, N½;
sec. 32, W½E½;
sec. 34, W½SE¼, SE¼SE¼.

UNITED STATES DEPARTMENT OF AGRICULTURE
FOREST SERVICE
HUMBOLDT NATIONAL FOREST
Wells, Nevada 89835

REPLY TO: 8310 Environmental Analysis

October 21, 1974

SUBJECT: Input to the Elko BLM District Oil, Gas and Geothermal Environmental Analysis Record

TO: Forest Supervisor

Enclosed is the Environmental Worksheet from the Wells Ranger District. I found this worksheet difficult to answer with any certainty as it covered such a broad land base. Also, we had no knowledge of what degree or type of work might be accomplished on National Forest land. Most of it had to be answered as unknown.

I don't feel that we should restrict Oil, Gas or Geothermal leasing on areas of land such as deer winter range or wildhorse range. On areas of land in Wyoming, I have observed many deer in and around drilling and production areas. There appeared to be no adverse effect on their feeding and migration patterns. I recommend that the deer winter and wildhorse ranges be deleted from the map we send to the BLM as areas we would oppose leasing operations to take place.

Val R. Gibbs

VAL R. GIBBS
District Forest Ranger

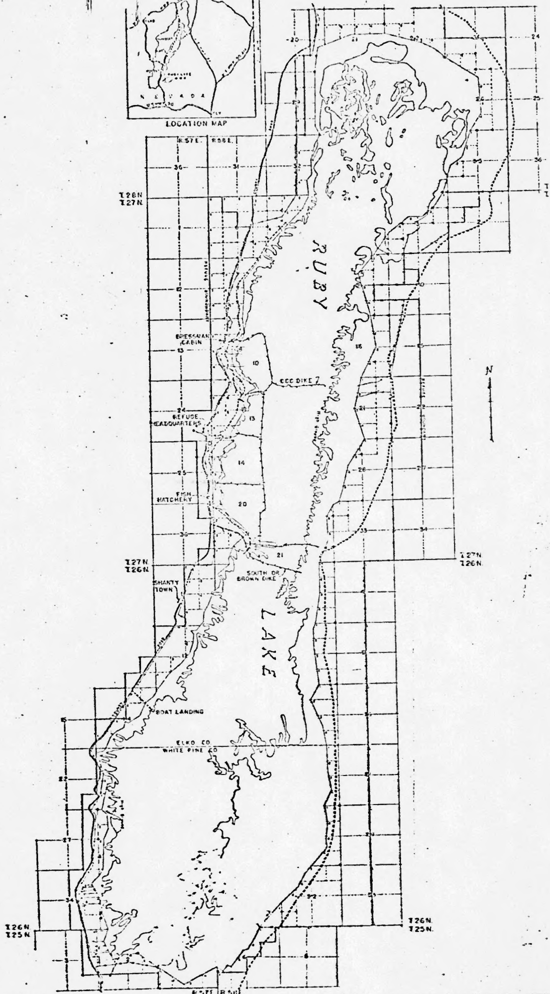
Enclosure

RECEIVED HUMBOLDT N.F.
Copies Rec'd
Copies Sent Rgrs.
Circular

OCT 28 '74

| ROUTE | ACTION |
|---|---|
| Supervisor | |
| Admin. Off. | |
| Fire & Rec. | |
| Range & W. | |
| Engineering | |
| Mining Engr. | |
| A. A. | |
| B. & F. | |
| Personnel | |
| Purch. Agent | |
| Res. Asst. | |
| [illegible] | |
| Lands Inv. | |
| [illegible] Spec. | |
| A. | |
| [illegible] | |
| [illegible] 12345 | |
| [illegible] | |
| | |

# ATTACHMENT II



UNITED STATES GOVERNMENT

# Memorandum

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
ELKO DISTRICT OFFICE
2002 Idaho Street
Elko, Nevada 89801

(N-013.1)

DATE: July 30, 1974

TO : Oil & Gas Geothermal E.A.R. Team

FROM : District Manager

SUBJECT: Team Assignment

The Oil and Gas Geothermal Environmental Analysis must be done and in NSO not later than October 31, 1974. To avoid duplication of work, we have decided to cover the District under one comprehensive analysis.

Because of the importance of energy related action in the Bureau's overall program and the size of the area involved, this job will be done through the team approach. Team assignments are as follows:

Team Leader - George Ramey

Geologist - Bob Randolph

Geothermal Specialist - William White

Wildlife - Dave Goicoechea

Land Resource Economics - Ron Fellows

Watershed/Range/Horses - Bruce Portwood

Recreation - Richard Law

The team assignments will be made during the first meeting on 8/1/74.

First meeting assignments given with team reports out by 9/6/74.

Moore

# EXHIBIT B LANDS EXCLUDED FROM LEASING

## No Leasing

#7 Ecological Area - Cherry Creek's Engelman Spruce

T. 26 N., R. 63 E.
sec. 5: All
sec. 8: E½
sec. 9: All
sec. 16: All
sec. 17: E1.
T. 27 N., R. 62 E.
sec. 13: All.
T. 27 N., R. 63 E.
sec. 18: lot 1,2,3.4, E½W½
sec. 19: All
sec. 20: W½
sec. 29: W½
sec. 30: lot 1,2, E½, E½NW¼
sec. 31: E½
sec. 32: All.

#7 Ecological Area - Bristlecone Pine

T. 27 N., R. 57 E.
secs. 2-4: All
secs. 9-11: All
secs. 14-16: All
secs. 21-23: All.
T. 28 N., R. 57 E.
secs. 33-35: All.

#1 High Use Rec. Area - Zunino Reservoir

T. 30 N., R. 56 E.
sec. 21: SE¼
sec. 22: S½
sec. 27: N½, SW¼
sec. 28: E½.

#1a High Use Rec. Area - Angel Lake

T. 36 N., R. 61 E.
sec. 2: lot 3,4,5,6, S½NW¼, SW¼, S½NE¼SE¼, W½NW¼SE¼, SE¼NW¼SE¼, S½SE¼
sec. 3: All
sec. 4: All
secs. 9-11: All
sec. 14: N½, W½SW¼.

T. 37 N., R. 61 E.
sec. 35: W½.

#1b High Use Rec. Area - Tent Mtn.

T. 35 N., R. 61 E.
sec. 6: All.
T. 36 N., R. 60 E.
sec. 14: E½SW¼, SE¼
secs. 23-26: All
sec. 35: All
sec. 36: All.
T. 36 N., R. 61 E.
sec. 19: All
sec. 20: All
secs. 29-32: All.

#7 Ecological Area and Primitive Values - Pilot Peak Engelman Spruce

T. 37 N., R. 69 E.
sec. 1: All
sec. 12: All
sec. 13: All
sec. 24: All
sec. 25: All.
T. 37 N., R. 70 E.
secs. 4-9: All
secs. 16-20: All
sec. 29: All
sec. 30: All.
T. 38 N., R. 70 E.
sec. 16: All
sec. 20: All
sec. 21: All
secs. 28-33: All.

#1 High Use Rec. Area - Wilson Reservoir

T. 44 N., R. 50 E.
sec. 25: W½
sec. 26: All
sec. 27: All
sec. 34: All
sec. 35: All
sec. 36: W½.

#1 High Use Rec. Area - Owyhee Canyon

T. 44 N., R. 54 E.
sec. 4: All
sec. 5: All
secs. 8-10: All
secs. 14-16: All
sec. 22: All
sec. 23: All.
T. 45 N., R. 54 E.
sec. 31: All
sec. 32: All.

#1 High Use Rec. Area - Wildhorse Reservoir

T. 43 N., R. 54 E.
sec. 1: All.
T. 43 N., R. 55 E.
secs. 4-6: All
sec. 8: All
sec. 9: All
sec. 16: All
sec. 17: All.
T. 44 N., R. 54 E.
sec. 24: All
sec. 25: All
sec. 36: All.
T. 44 N., R. 55 E.
secs. 16-20: All
secs. 27-33: All.

#5 Mountain City Municipal Watershed

T. 46 N., R. 53 E.
sec. 1: All
sec. 11: E½
sec. 12: All
sec. 13: All
sec. 14: E½
sec. 23: E½
sec. 24: All.
T. 46 N., R. 54 E.
sec. 6: All
sec. 7: All
sec. 18: All.
T. 47 N., R. 54 E.
sec. 31: All.

#6 Archeological Area

T. 45 N., R. 54 E.
  sec. 21: All
  sec. 28: All.

#3 Wilderness Area - Jarbidge Wilderness Area

T. 44 N., R. 58 E.
  secs. 1-4: All
  secs. 8-17: All
  secs. 20-36: All.
T. 44 N., R. 59 E.
  secs. 3-10: All
  secs. 17-20: All
  sec. 30: All
  sec. 31: All.
T. 45 N., R. 58 E.
  sec. 1: All
  sec. 2: All
  sec. 12: All
  sec. 13: All
  secs. 21-28: All
  secs. 33-36: All.
T. 45 N., R. 59 E.
  secs. 1-24: All
  secs. 27-34: All.
T. 46 N., R. 58 E.
  secs. 24-26: All
  sec. 35: All
  sec. 36: All.
  T. 46 N., R. 59 E.
  secs. 8-10: All
  secs. 15-22: All
  secs. 25-36: All.

#5 Jarbidge Culinary Watershed

T. 45 N., R. 58 E.
  sec. 5: All
  sec. 6: All.
T. 46 N., R. 58 E.
  sec. 8: All
  sec. 9: All
  sec. 16: All
  sec. 17: All
  sec. 20: All
  sec. 21: All
  secs. 29-32: All.

#2 Significant Primitive Value - Jarbidge River (Wild and Scenic)

T. 47 N., R. 58 E.
sec. 1: lot 1,2, S½NE¼, SE¼
T. 47 N., R. 59 E.
secs. 6-8: All
sec. 16: W½
sec. 17: All
sec. 18: E½
sec. 19: E½
sec. 20: All
sec. 21: W½
sec. 28: W½
sec. 29: All
sec. 30: E½.

#2 Significant Primitive Value - Bruneau River (Wild and Scenic)

T. 47 N., R. 56 E.
sec. 3: lot 3,4
sec. 4: All
sec. 5: SE¼
sec. 8: All
sec. 9: W½.

#1 High Use Rec. Area - Green Mtn.

T. 29 N., R. 57 E.
sec. 3: All
sec. 4: All
sec. 9: All
sec. 10: All
sec. 15: All
sec. 16: All.

#4 High Scenic Area - Ruby Mtns. Scenic Area

T. 29 N., R. 57 E.
sec. 1: All
sec. 2: All
secs. 11-14: All
sec. 23: All
sec. 24: All.

T. 29 N., R. 58 E.
  secs. 4-8: All
  sec. 18: All
  sec. 19: All.
T. 30 N., R. 57 E.
  sec. 1: All
  sec. 2: All
  secs. 11-14: All
  secs. 22-27: All
  secs. 34-36: All.
T. 30 N., R. 58 E.
  secs. 2-11: All
  secs. 15-22: All
  secs. 27-34: All.
T. 31 N., R. 57 E.
  sec. 1: All.
T. 31 N., R. 58 E.
  secs. 1-29: All
  secs. 32-35: All.
T. 31 N., R. 59 E.
  sec. 6: All
  sec. 7: All.
T. 32 N., R. 57 E.
  sec. 25: All
  sec. 35: All
  sec. 36: All.
T. 32 N., R. 58 E.
  secs. 4-11: All
  secs. 13-36: All.
T. 32 N., R. 59 E.
  secs. 17-20: All
  secs. 29-32: All.

#2 Significant Primitive Values - Ruby Mountains

T. 31 N., R. 58 E.
  sec. 36: All.
T. 31 N., R. 59 E.
  sec. 4: All
  sec. 5: All
  sec. 8: All
  secs. 17-19: All
  sec. 30: All.
T. 32 N., R. 58 E.
  secs. 1-3: All
  sec. 12: All.
T. 32 N., R. 59 E.
  secs. 3-10: All
  sec. 16: All
  sec. 21: All
  sec. 28: All
  sec. 33: All.

T. 33 N., R. 58 E.
sec. 25: All
sec. 35: All
sec. 36: All.
T. 33 N., R. 59 E.
sec. 15: All
sec. 16: lot 5,6,7,8, E½, S½SW¼
sec. 17: lot 3,4,5,6
sec. 19: lot 9,10,13,14,15
sec. 20: lot 4,5,6, E½, SW¼
secs. 21-23: All
secs. 26-29: All
sec. 30: lot 2,3,4,5,6,7,8,9,10,11,12,13, E½
sec. 31: lot 1,2,3,4,5,6,7,8,9,10,11,12, E½
secs. 32-35: All.

#2 Significant Primitive Value - S.F. Little Humboldt River

T. 40 N., R. 45 E.
secs. 2-5: All
secs. 9-16: All
secs. 22-24: All
T. 41 N., R. 44 E.
sec. 11: SE¼
sec. 12: S½
sec. 13: E½, NW¼
sec. 14: NE¼
sec. 24: E½.
T. 41 N., R. 45 E.
sec. 7: lot 3,4, E½SW¼, SE¼
sec. 8: S½
sec. 9: S½
sec. 10: SW¼
sec. 15: W½
secs. 16-21: All
sec. 22: W½
sec. 27: W½
sec. 28: All
sec. 29: All
sec. 30: E½
sec. 31: E½
sec. 32: All
sec. 33: All
sec. 34: W½.

#7 Ecological Areas
a. Winters Creek
/ ?
T. 47 N., R. 48 E.
sec. 9: S½NE¼, SE¼NW¼, E½SW¼, SE¼
sec. 10: S½NW¼, SW¼

sec. 14: W½
sec. 15: All
sec. 16: E½, NE¼NW¼
sec. 21: NE¼, N½SE¼
sec. 22: All
sec. 23: W½.

b. Fraizer Creek

T. 39 N., R. 46 E.
secs. 1-4: All
sec. 5: lot 1,2, S½NE¼, SE¼
sec. 10: N½NE¼
sec. 11: N½N½
sec. 12: N½N½.
T. 39 N., R. 47 E.
sec. 5: All
sec. 6: All
sec. 7: lot 1,2,3, E½, E½W½
sec. 8: All
sec. 17: N½NE¼, W½
sec. 18: E½E½, W½NE¼, NE¼NW¼, NW¼SE¼.
T. 40 N., R. 46 E.
sec. 25: E½, E½W½, SW¼NW¼, W½SW¼
sec. 32: SE¼
sec. 33: SW¼, NE¼SE¼, S½SE¼
sec. 34: NE¼NE¼, S½N½, S½
sec. 35: All
sec. 36: All.
T. 40 N., R. 47 E.
sec. 30: lot 1,2,3,4, E½W½
sec. 31: All
sec. 32: lot 5,6,7,8.

✓ #7 Ecological Area - Franklin Lake

T. 28 N., R. 58 E.
secs. 1-4: All
sec. 9: E½, NW¼, N½SW¼
sec. 10: All
sec. 11: All
sec. 12: W½
sec. 13: NW¼
sec. 14: N½
sec. 15: N½
sec. 16: NE¼.

T. 29 N., R. 58 E.
sec. 13: lot 1,2,3, NE¼SE¼, S½SE¼
sec. 15: lot 1,2,3,4, W½
sec. 16: E½SE¼
sec. 21: E½NE¼, SE¼
sec. 22: lot 1,2,3,4, NW¼, N½SW¼
sec. 24: lot 1,2,3,4, E½, E½SW¼
sec. 25: lot 1, E½W½, SW¼NW¼, W½SW¼
sec. 26: lot 1,2,3, SE¼SE¼
sec. 27: lot 1
sec. 28: lot 1,2,3,4,5, E½W½, W½SW¼
sec. 33: lot 1,2,3,4, W½
sec. 34: lot 4
sec. 35: lot 1,2,3,4, E½, E½SW¼
sec. 36: All.
T. 29 N., R. 59 E.
sec. 18: lot 3,4,5, S½NE¼, SE¼NW¼, E½SW¼, SE¼
sec. 19: lot 5,6,7,8, W½E½, W½
sec. 30: lot 5,6,7,8, W½E½, W½
sec. 31: lot 5,6,7,8, W½E½, W½.

#1 High Use Rec. Area - Ruby Marsh Campground

T. 27 N., R. 57 E.
sec. 36: NW¼NE¼, S½NE¼, N½SE¼, SW¼SE¼.

EXHIBIT B NO LEASING PENDING FURTHER STUDY

No Leasing Pending Further Study

#2 Significant Primitive Values - East Humboldt

T. 35 N., R. 60 E.
  secs. 1-3: All
  secs. 9-16: All
  secs. 22-26: All.
T. 35 N., R. 61 E.
  sec. 4: All
  sec. 5: All
  secs. 7-9: All
  secs. 16-21: All
  sec. 30: All.
T. 36 N., R. 61 E.
  secs. 5-8: All
  secs. 15-18: All
  sec. 21: All
  sec. 22: All
  sec. 28: All
  sec. 33: All.
T. 37 N., R. 61 E.
  secs. 31-33: All.

#2 Significant Primitive Value - Independence Mtns.

T. 41 N., R. 53 E.
  secs. 2-5: All
  secs. 8-11: All
  secs. 14-16: All
  secs. 20-23: All
  secs. 26-29: All
  secs. 32-35: All.
T. 42 N., R. 53 E.
  secs. 1-3: All
  secs. 10-15: All
  secs. 21-28: All
  secs. 32-35: All.
T. 42 N., R. 54 E.
  secs. 5-8: All
  secs. 17-20: All
  secs. 29-32: All.
T. 43 N., R. 53 E.
  sec. 36: All.
T. 43 N., R. 54 E.
  sec. 31: All
  sec. 32: All.

#2 Significant Primitive Value - Rough Hills

T. 44 N., R. 56 E.
  sec. 12: E½
  sec. 13: E½
  sec. 24: E½
  sec. 25: E½.
T. 44 N., R. 57 E.
  sec. 7: All
  sec. 8: All
  sec. 16: W½, W½E½
  secs. 17-20: All
  sec. 21: W½, W½E½
  sec. 28: W½, W½E½
  sec. 29: All
  sec. 30: All
  sec. 31: N½
  sec. 32: N½
  sec. 33: W½NE¼, NW¼.

#2 Significant Primitive Value - Owyhee River

T. 45 N., R. 48 E.
  secs. 1-3: All
  sec. 12: All.
T. 45 N., R. 49 E.
  secs. 4-9: All
  secs. 16-18: All
  sec. 20: All
  sec. 21: All.
T. 46 N., R. 47 E.
  sec. 1: All
  sec. 2: All
  sec. 12: All.
T. 46 N., R. 48 E.
  secs. 3-10: All
  secs. 15-18: All
  secs. 20-22: All
  secs. 26-28: All
  secs. 34-36: All.
T. 47 N., R. 47 E.
  secs. 2-4: All
  secs. 9-11: All
  secs. 14-16: All
  secs. 21-27: All
  secs. 34-36: All
T. 47 N., R. 48 E.
  secs. 19-22: All
  secs. 27-34: All.

#2 Significant Primitive Value - Mahogany Mtns.

T. 45 N., R. 54 E.
  sec. 1: All
  sec. 2: All
  secs. 11-14: All.
T. 45 N., R. 55 E.
  secs. 3-10: All
  secs. 15-18: All.
T. 46 N., R. 54 E.
  sec. 1: All
  sec. 12: All
  sec. 13: All
  secs. 23-26: All
  sec. 36: All.
T. 46 N., R. 54½ E.
  sec. 6: All
  sec. 7: All
  sec. 18: All
  sec. 19: All
  sec. 30: All
  sec. 31: All.
T. 46 N., R. 55 E.
  secs. 5-9: All
  secs. 16-21: All
  secs. 28-34: All.
T. 47 N., R. 54 E.
  sec. 25: All
  sec. 36: All.
T. 47 N., R. 54½ E.
  sec. 19: All
  sec. 30: All
  sec. 31: All.
T. 47 N., R. 55 E.
  secs. 19-21: All
  secs. 28-33: All.

#2 Significant Primitive Values
a. Jarbidge

T. 44 N., R. 59 E.
  sec. 1: All
  sec. 2: All
  sec. 11: All
  sec. 12: All.
T. 45 N., R. 59 E.
  sec. 25: All
  sec. 26: All
  sec. 35: All
  sec. 36: All.

T. 45 N., R. 60 E.
  sec. 2: lot 3,4, SW¼
  sec. 3: lot 1,2,3,4, S½
  sec. 4: lot 1,2,3,4, S½
  sec. 5: lot 1,2,3,4, S½
  sec. 6: lot 1,2,3,4,5,6,7,8,9, E½SW¼, SE¼
  sec. 7: lot 1,2,3,4,5,6,7,8, E½, E½W½
  secs. 8-10: All
  secs. 15-22: All
  secs. 28-33: All.
T. 46 N., R. 60 E.
  sec. 15: All
  sec. 16: All
  secs. 20-22: All
  secs. 27-34: All.

b. Copper Mtns.

T. 44 N., R. 57 E.
  secs. 1-3: All
  sec. 10: All
  sec. 11: All.
T. 45 N., R. 57 E.
  secs. 1-5: All
  secs. 9-16: All
  secs. 21-28: All
  secs. 34-36: All.
T. 45 N., R. 58 E.
  sec. 7: All
  sec. 18: All
  sec. 19: All
  sec. 30: All
  sec. 31: All.
T. 46 N., R. 57 E.
  sec. 14: All
  secs. 20-36: All

#2 Significant Primitive Values
a. Wilson Creek

T. 46 N., R. 62 E.
  sec. 5: lot 1,2,3,4.
T. 47 N., R. 62 E.
  sec. 6: All
  sec. 7: All
  sec. 18: All
  sec. 19: All
  secs. 30-32: All.

b. Salmon Falls River

T. 46 N., R. 62 E.
 sec. 3: S½
 sec. 10: All
 sec. 15: All
 sec. 16: E½
 sec. 20: E½
 sec. 21: All.

c. Bad Lands - Salmon Falls River

T. 45 N., R. 62 E.
 secs. 21-23: All
 sec. 26: All
 sec. 27: All
 sec. 35: All
 sec. 36: All.

#2 Significant Primitive Value - Goshute Mtns.
(Wild and Scenic)

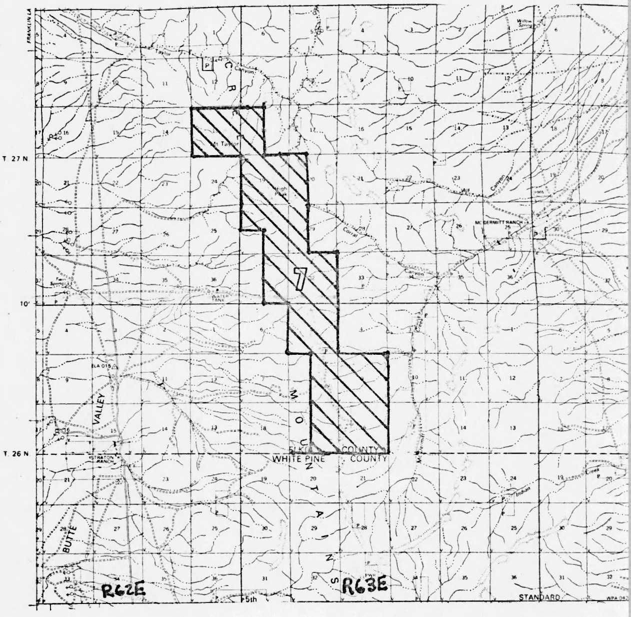
T. 29 N., R. 68 E.
 secs. 1-3: All
 secs. 10-15: All.
T. 30 N., R. 68 E.
 secs. 1-28: All
 secs. 33-35: All.
T. 31 N., R. 68 E.
 secs. 3-10: All
 sec. 14: W½
 secs. 15-23: All
 sec. 26: All
 sec. 27: All
 secs. 31-35: All
 sec. 36: W½
T. 32 N., R. 68 E.
 secs. 3-10: All
 sec. 15: All
 sec. 16: All
 sec. 17: E½, NW¼
 sec. 18: lot 1,2, NE¼, E½NW¼
 sec. 19: lot 3,4, E½SW¼, SE¼
 sec. 20: E½, SW¼
 sec. 21: All
 sec. 22: N½
 secs. 28-33: All
 sec. 34: S½

T. 33 N., R. 68 E.
   secs. 19-21:  All
   secs. 27-34:  All

EXHIBIT B MAPS

EXHIBIT B

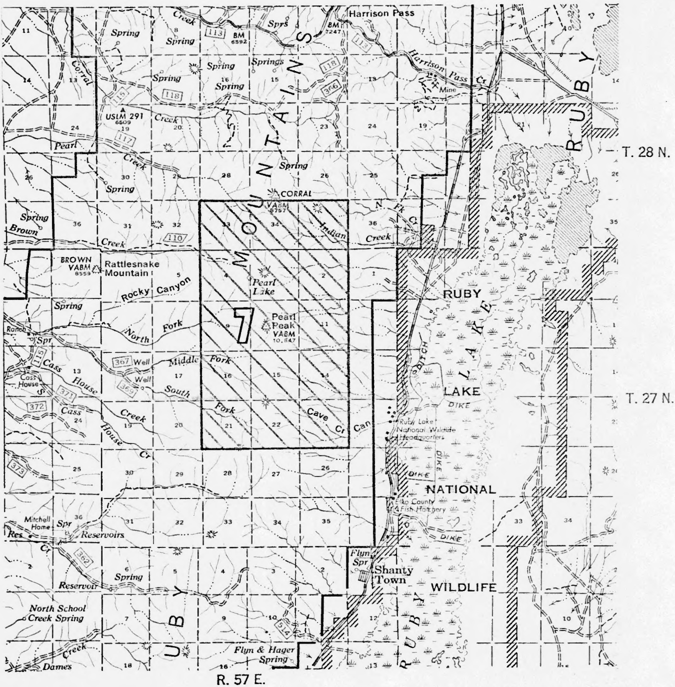
MAP NO. 1



7 - Ecological Area
Cherry Creek's Engleman Spruce

EXHIBIT B

MAP NO. 2



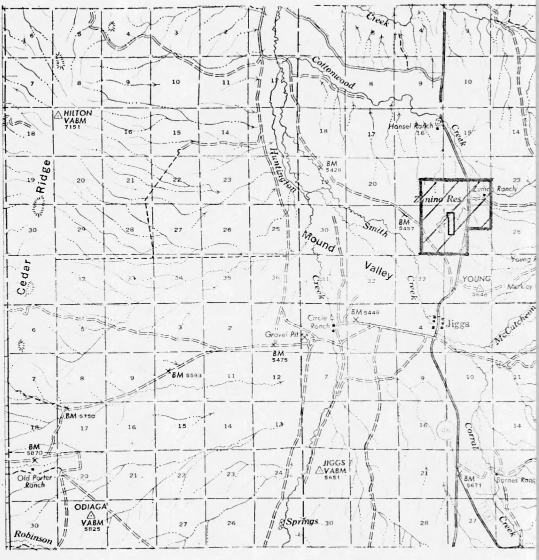
7 - Ecological Area
Bristlecone Pine

EXHIBIT B

MAP NO. 3

T. 30 N.

T. 29 N.



R. 55 E.

R. 56 E.

1 - High Use Rec. Area
Zunino Reservoir

EXHIBIT B

## MAP NO. 4

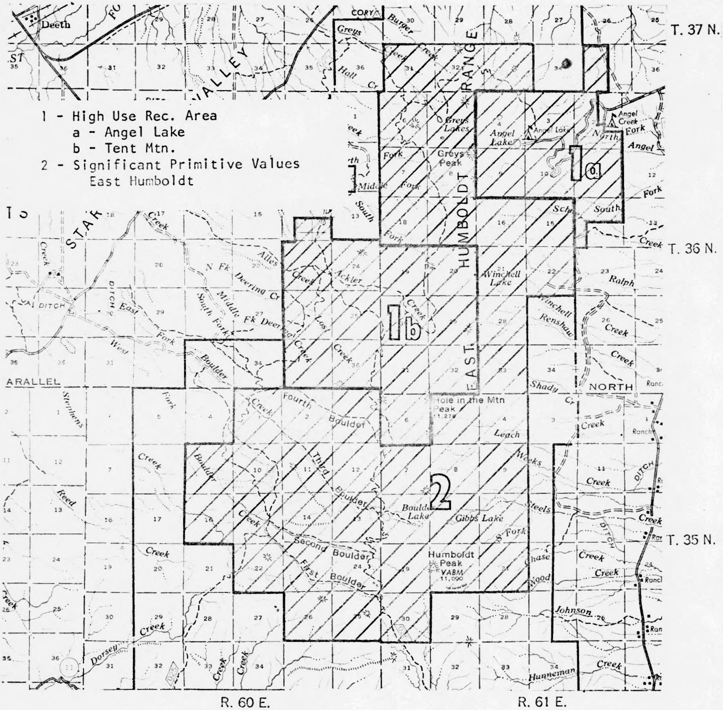
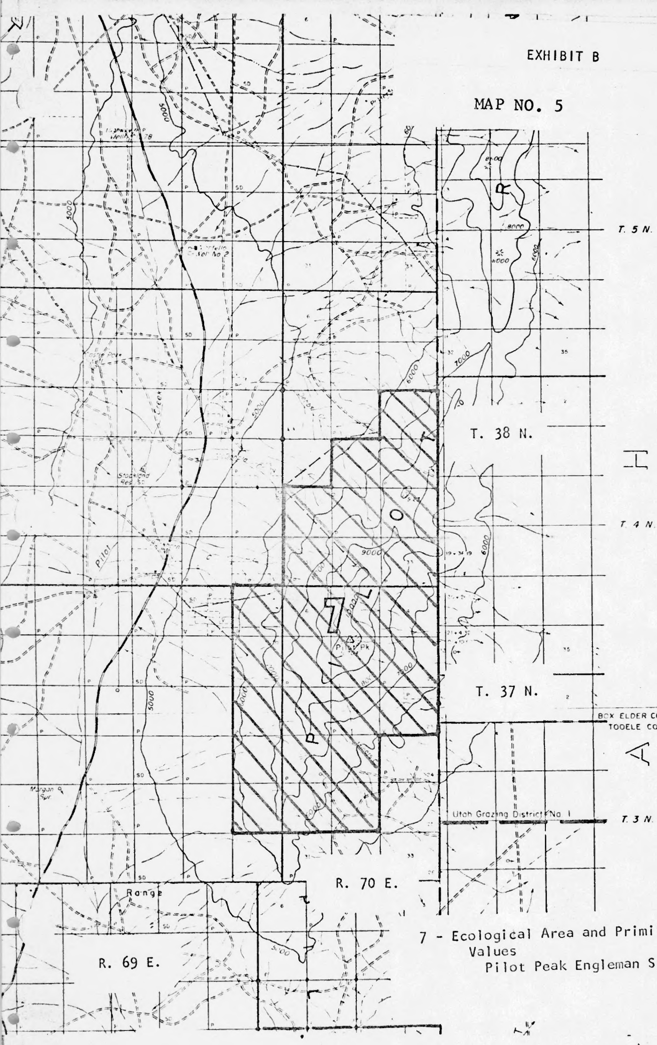


EXHIBIT B

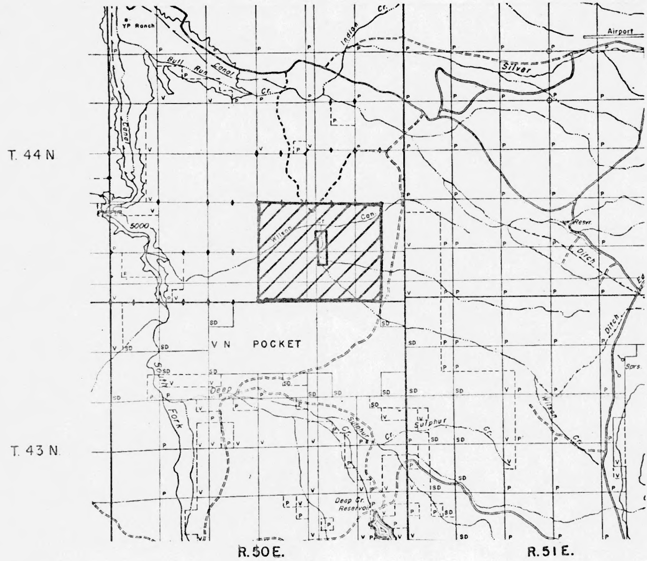
MAP NO. 5



7 - Ecological Area and Primitive Values
Pilot Peak Engleman Spruce

EXHIBIT B

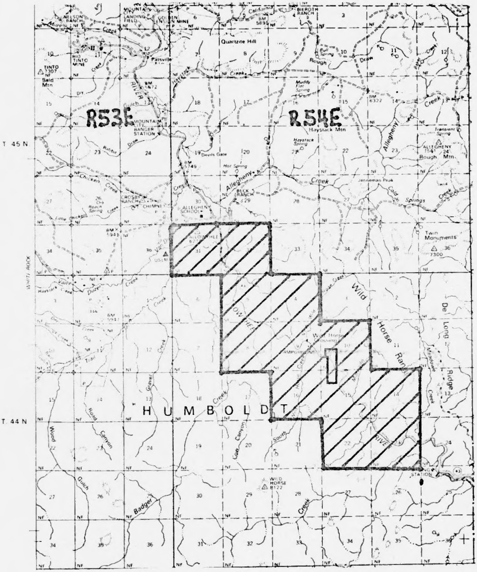
MAP NO. 6



1 - High Use Rec. Area
Wilson Reservoir

EXHIBIT B

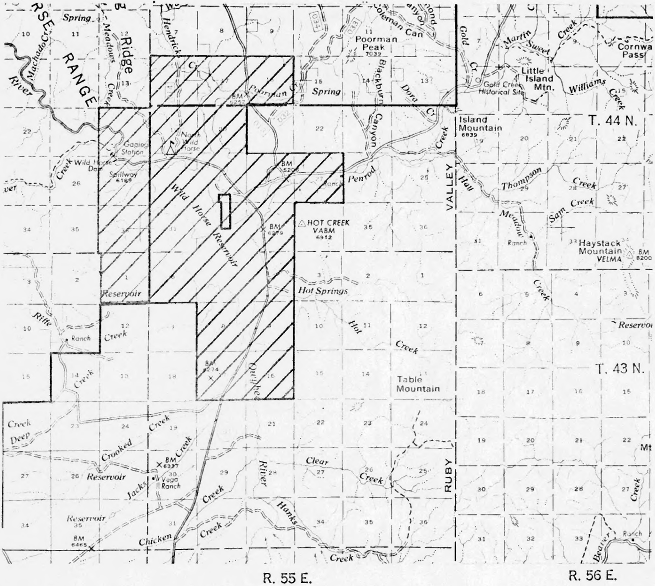
## MAP NO. 7



1 - High Use Rec. Area
Owyhee Canyon

EXHIBIT B

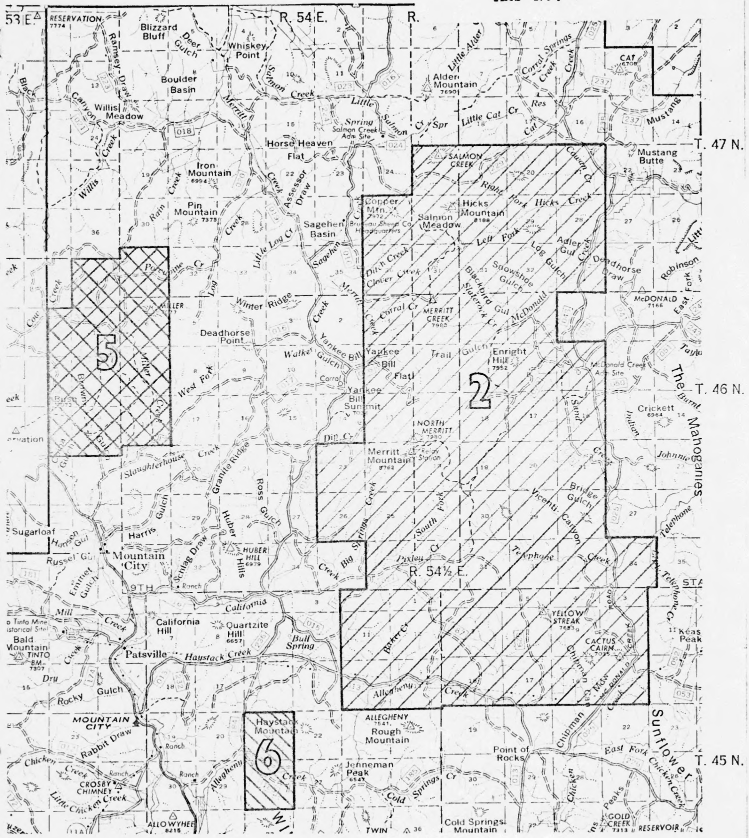
## MAP NO. 8



1 - High Use Rec. Area
Wildhorse Reservoir

EXHIBIT B

MAP NO. 9



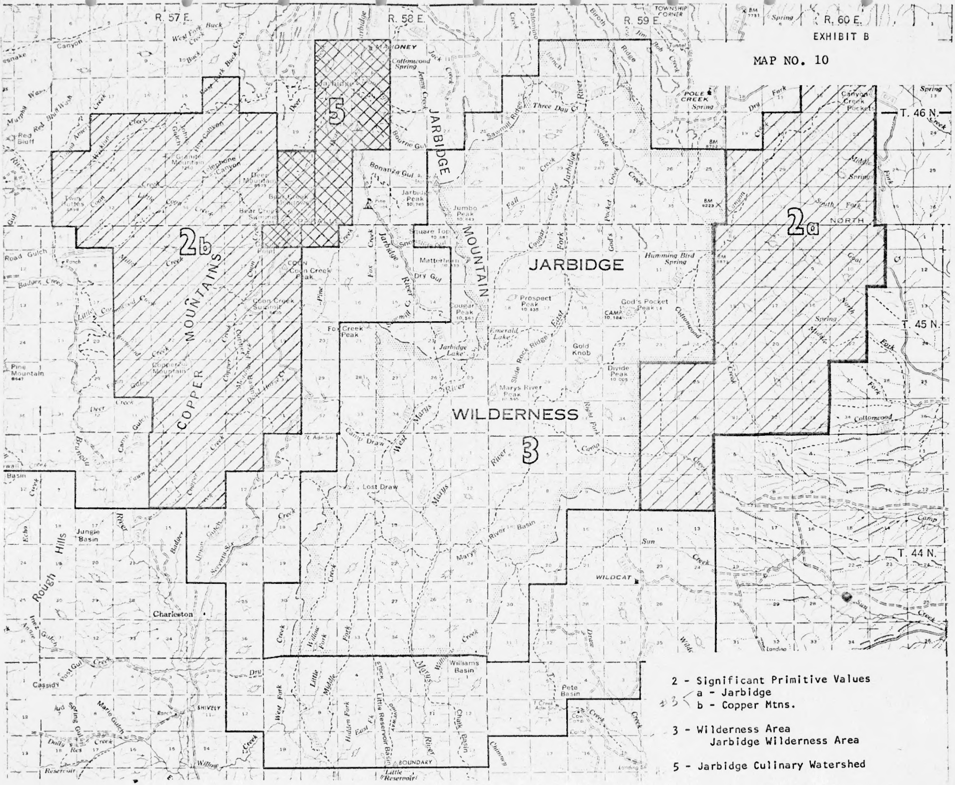
2 - Significant Primitive Value
Mahogany Mtns. #5

5 - Mountain City Municipal Watershed

6 - Archaeology Area

EXHIBIT B

MAP NO. 10



2 - Significant Primitive Values
a - Jarbidge
b - Copper Mtns.

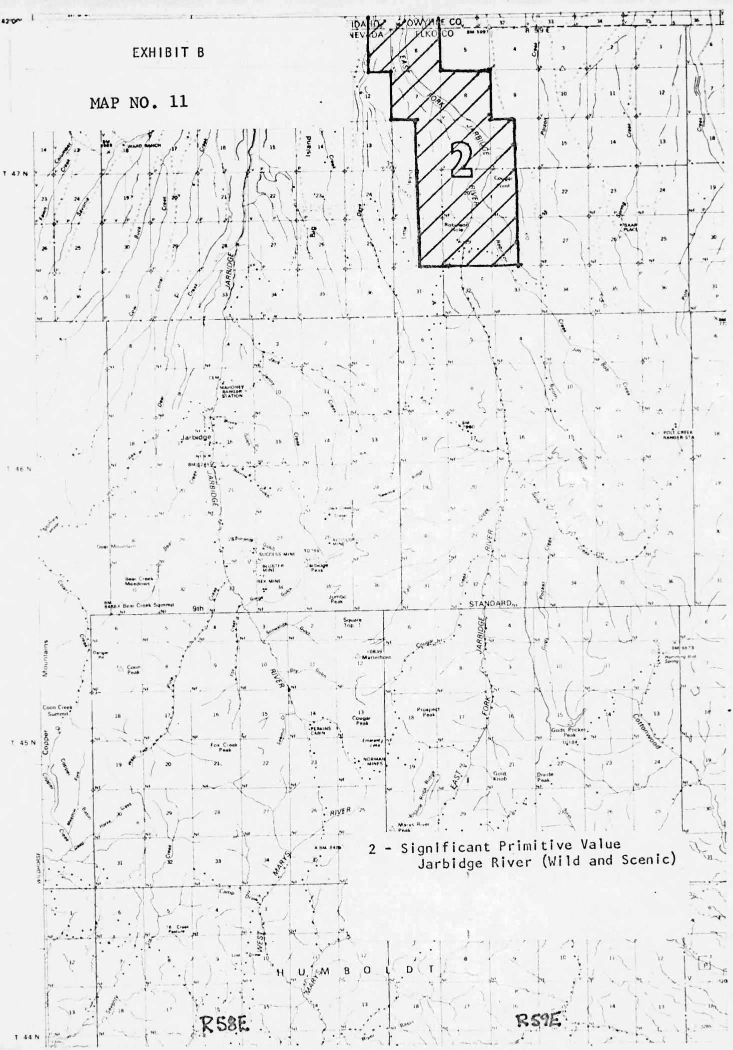
#3

3 - Wilderness Area
Jarbidge Wilderness Area

5 - Jarbidge Culinary Watershed

EXHIBIT B

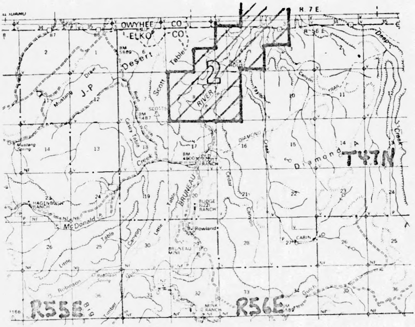
MAP NO. 11



2 - Significant Primitive Value
Jarbidge River (Wild and Scenic)

EXHIBIT B

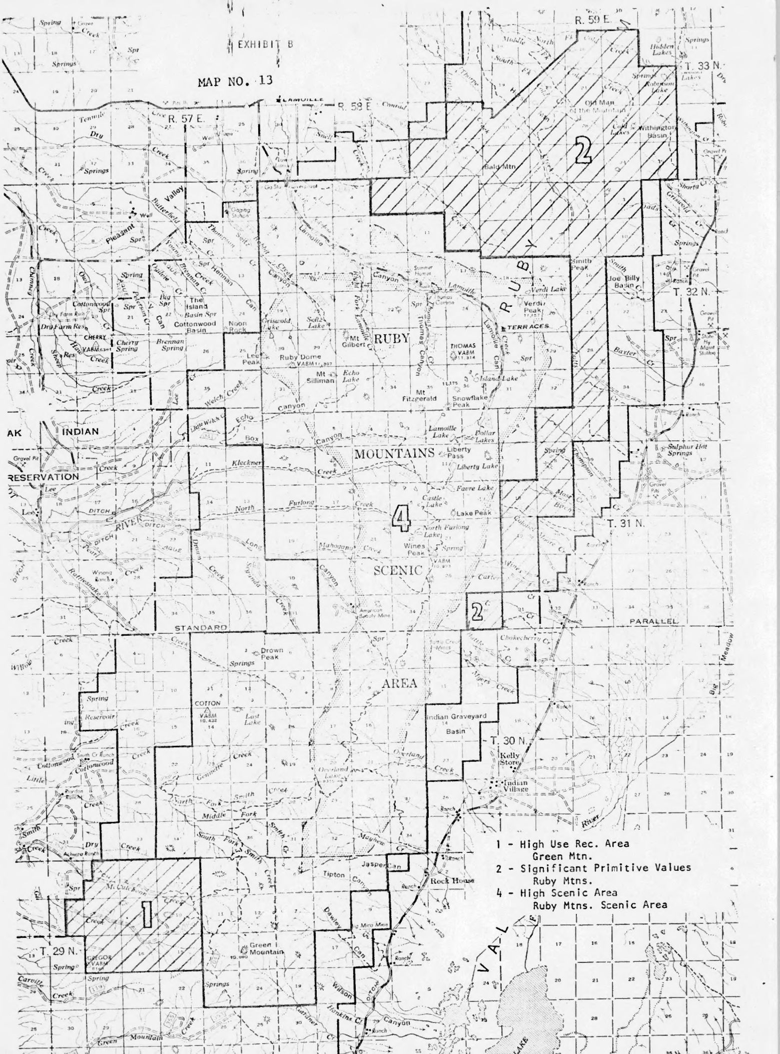
MAP NO. 12



2 - Significant Primitive Value
Bruneau River (Wild & Scenic)

EXHIBIT B

MAP NO. 13



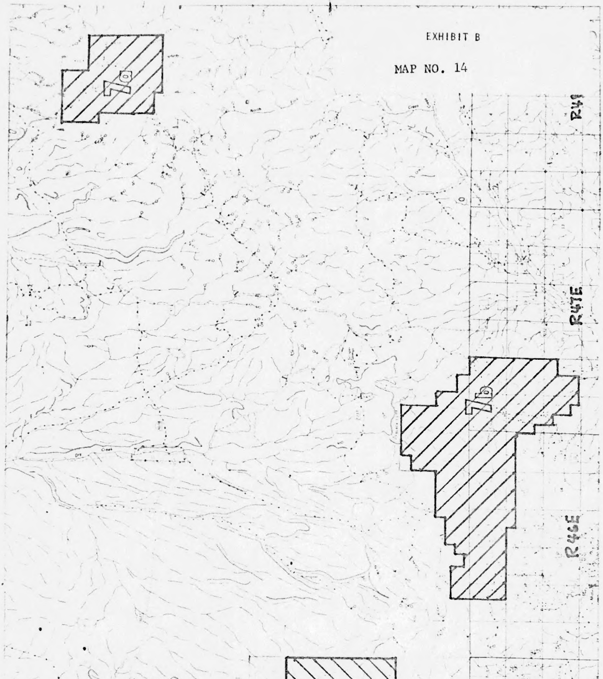
1 - High Use Rec. Area
Green Mtn.

2 - Significant Primitive Values
Ruby Mtns.

4 - High Scenic Area
Ruby Mtns. Scenic Area

EXHIBIT B

MAP NO. 14



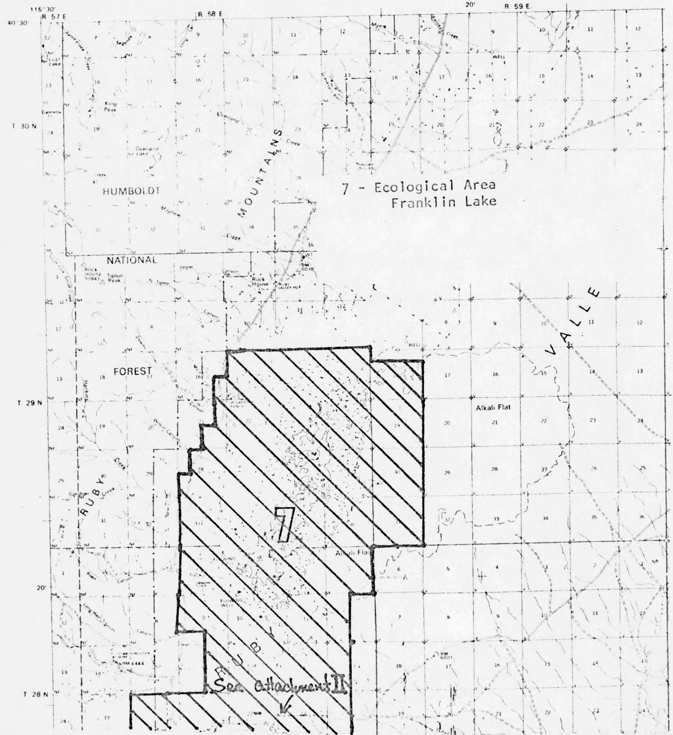
2 - Significant Primitive Value
South Fork Little Humboldt River

7 - Ecological Areas
a - Winters Creek
b - Fraizer Creek

EXHIBIT B

MAP NO. 15

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT



7 - Ecological Area
Franklin Lake

See attachment II

EXHIBIT B (Continued)

MAP NO. 16

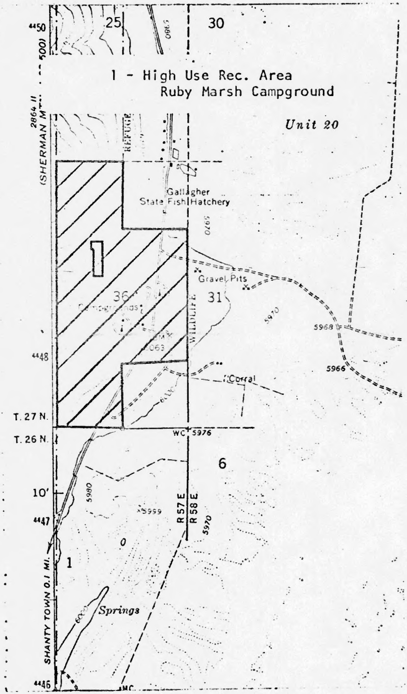
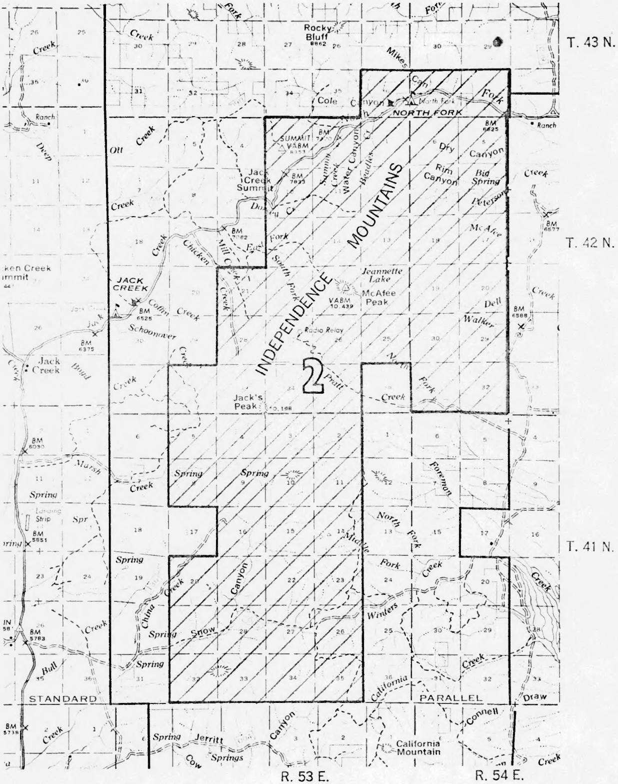


EXHIBIT B

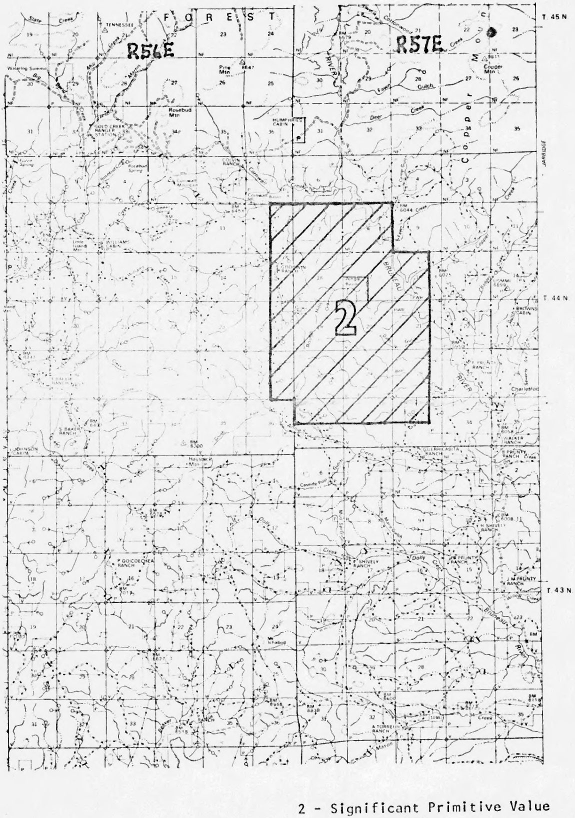
MAP NO. 17



2 - Significant Primitive Value
Independence Mtns.

EXHIBIT B

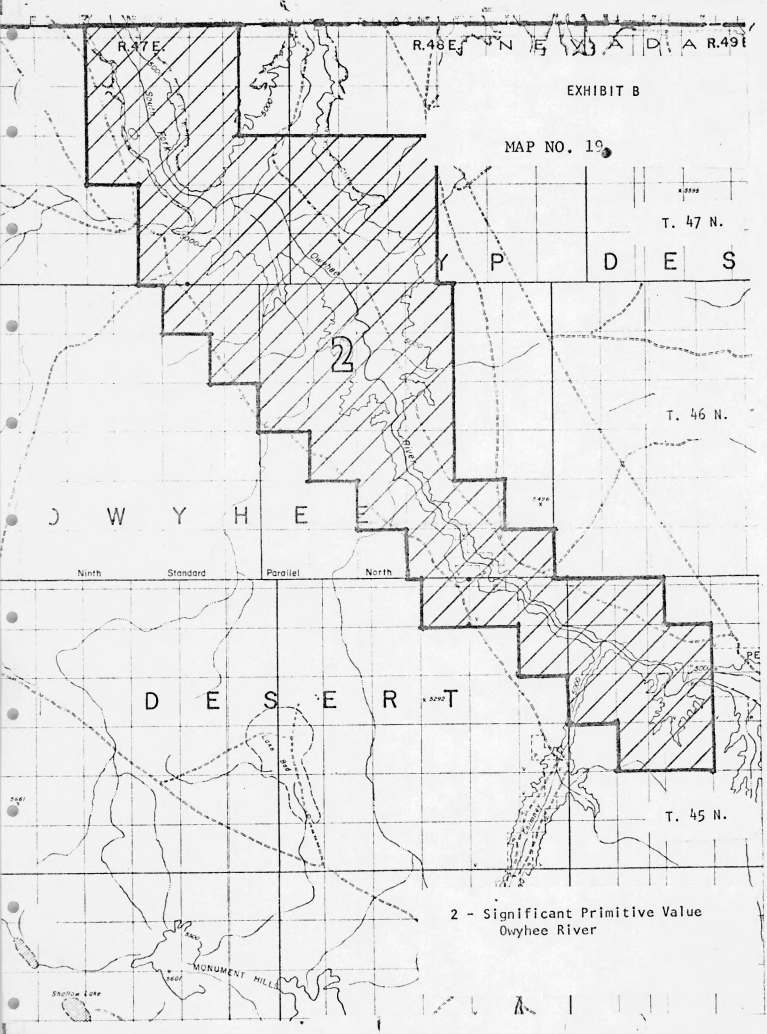
MAP NO. 18



2 - Significant Primitive Value
Rough Hills

EXHIBIT B

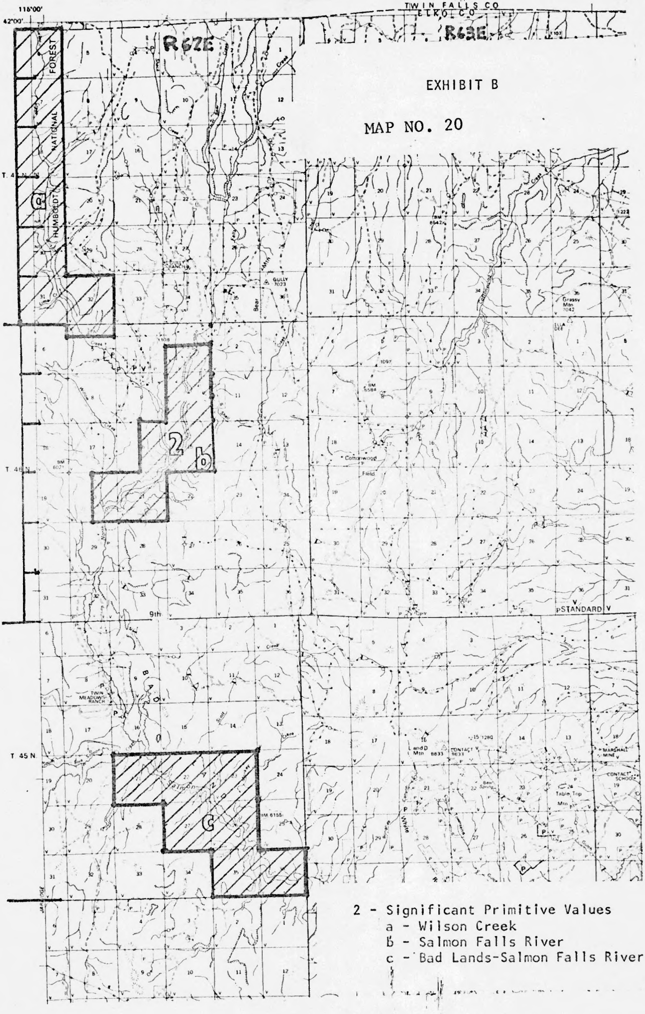
MAP NO. 19



2 - Significant Primitive Value
Owyhee River

EXHIBIT B

MAP NO. 20

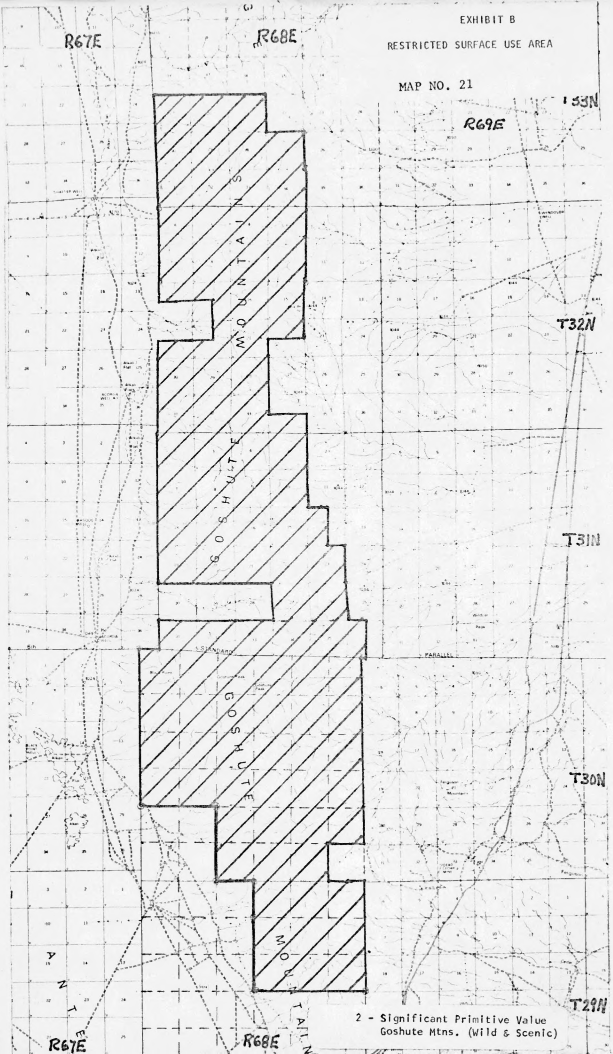


2 - Significant Primitive Values
- a - Wilson Creek
- b - Salmon Falls River
- c - Bad Lands-Salmon Falls River

EXHIBIT B

RESTRICTED SURFACE USE AREA

MAP NO. 21



2 - Significant Primitive Value
Goshute Mtns. (Wild & Scenic)